the OIL AND GAS JOURNAL

Middle East Flare Gas...

There's less than people think P. 80

The Sad Plight of American Tankers . . . .

P. 84

Flooding With L.P.G.

New tool for the future? P. 92

100 Octane Clear

. . . BY NEW PROCESS. Anticipating tomorrow's motor-fuel needs—P. 102

MARCH 28, 1955

TRUTH DETECTOR TEST

The hardest lesson oil men learned was that a show of oil didn't always mean a well. A sample from the drill stem test just indicates production is *possible*. Whether or not the sand will produce is determined by subsurface pressures. And that's when you want the most precise pressure recording device . . . Halliburton's Bourdon Tube. The "BT" is a truth detector . . . for this supersensitive instrument makes the most accurate, detailed pressure recording on a coated copper chart that cannot be faked or hand-drawn. After a field reading the chart goes to Halliburton's testing headquarters where trained "BT" specialists rigorously inspect it under a micrometer optical chart reader. The report you get back is the surest possible way to know you've got a well before setting casing. Let your nearby Halliburton testing operator give your well the truth detector test.

211 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

HALLIBURTON OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

PAGE 1 ONE . . . *a glance ahead*

Look for a record number of deep wildcats in California this year. The reason: they're finding more oil . . . and it's oil of high gravity. Deep holes last year found a third of the state's new fields, while numbering only a tenth of total wildcats drilled. Most deep tests will go below present pays in existing fields or test the flanks of known structures.

Lube-oil exports to Mexico will take a big drop this year. Mexico is protecting its new Salamanca refinery with a decree requiring lube importers to obtain licenses. Mexican demand is greater than its domestic output, but the country is guaranteeing a market for its home-grown products by requiring their use first.

Metering of crude oil will increase as oil companies gain confidence in measuring devices. An A.P.I. committee is now working on a standard for installation, calibration, operation, and maintenance of positive-displacement meters. This is the first time the A.P.I. has recognized a need for a separate section for crude-oil metering within Standard 2500. Greater use of meters should cut cost, simplify operations in the field.

Louisiana's offshore ownership squabble, now dormant, will flare up soon. Louisiana claims title outward as far as 35 miles from shore. This overlaps by many miles the area claimed by the federal Government. No companies have yet paid royalties to Louisiana. District Attorney Leander H. Perez is pushing state officials to either collect lease money and royalties from oil companies or cancel the leases.

Standard of Texas may put into operation next month the first commercial Reynolds Plotter unit. This new exploration tool, being built by Southwestern Industrial Electronics, is being widely hailed as the best new exploration device to appear in many years. The machine automatically works up seismic records into a finished cross-section ready for final interpretation.

Cambrian rocks will be getting more and more attention from oil companies. Geologists have not been inclined to consider the Cambrian as a serious prospect for prolific reservoirs because of the apparent lack of oil source beds. Spreading Cambrian production may prove this argument invalid.

the OIL AND GAS JOURNAL

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS

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TECHNOLOGY—OPERATION

New Process for 100 Octane 102

By H. D. Noll, J. W. Schall, R. J. Craig, and D. H. Stevenson

A new process, Iso-Plus Houdriforming, is now available to the refiner for production of 100 F-1 clear octane catalytic reformate. Two processing routes may be used: (1) a combination of Houdriforming and aromatics extraction or (2) Houdriforming at moderate severities followed by thermal reforming of the Houdriformate. Both processes are quite flexible. Either one yields high-octane product in a continuous operation with almost all virgin naphthas.

New Way to Map Continental Shelf 106

By W. Armstrong Price

A method of mapping the Continental Shelf has been developed on a regional basis. The approach and methods are in part those of shallow-water oceanography as developed on the Gulf Coast in recent years. The oceanographic methods are blended with those found useful in regional reconnaissance of the Pleistocene Plains on land.

Controlled Oil Production by Radio 112

Gulf Refining Co. is operating radio-controlled automatic producing facilities in Louisiana's Timbalier Bay field. This remote control system has worked well so far and promises widespread adoption for offshore use. The system reduces required manpower and saves money.

What Goes on Below? 115

By Carl R. Canfield

A multichannel recording oscillograph can now be fitted to an oil-well drill to see what actually goes on down at the bottom of the hole. There will be two important uses of this instrument: it will help evaluate drilling methods, and it will serve as a logging tool and record information about the formations drilled.

Sea-Water Mud for Drilling 118

By T. B. O'Brien

In Timbalier Bay field, Gulf Refining Co. has used salt-water mud successfully for 4 years. Cost is the same or slightly less than fresh-water mud of the same type where fresh water must be hauled in. Salt tends to prevent hydration of clays and shales. Mud making is reduced.

Measuring Very Low Temperatures 123

By J. C. Evans

Liquid-air separation units are coming into increasing use in connection with partial oxidation of natural gas. Temperatures in the liquid-air units run about —325° F. Temperature measurement problems are quite complicated in this region. With this in mind, the author recommends use of e.m.f.-type temperature instrument.

Checking Rectifier Efficiency 126

By Charles D. Stroud

Here is a new method for checking stability and efficiency of dry-type rectifiers used in cathodic protection of pipelines. Only a few simple tests and a curve drawn from the resulting data are required.

Pipeline Patrol 147

Diversity reception is one of the best answers to a common problem on microwave systems, that of fades caused by atmospheric changes.—Pipeline microwave use hits 11,000 miles.—Overhead mounting of mobile radio units saves leg room in pipeline maintenance trucks.

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swing joints

YOU CAN ALWAYS DEPEND ON . . . . .

for unlimited flow line flexibility, greater load carrying capacity!

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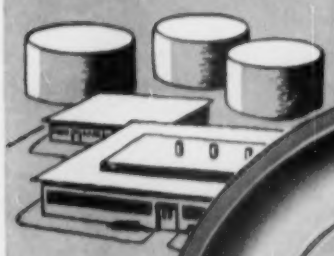
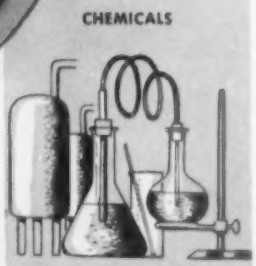
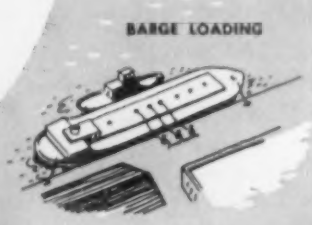




A wide range of styles and sizes makes possible many and varied applications for safely handling liquids of diversified viscosity at required temperatures and working pressures.

Exhaustive field research has directed OPW in planning a complete line of Swing Joints to fit all requirements.

FREE CATALOG F-8
provides engineering data, sizes, styles, recommendations and prices.



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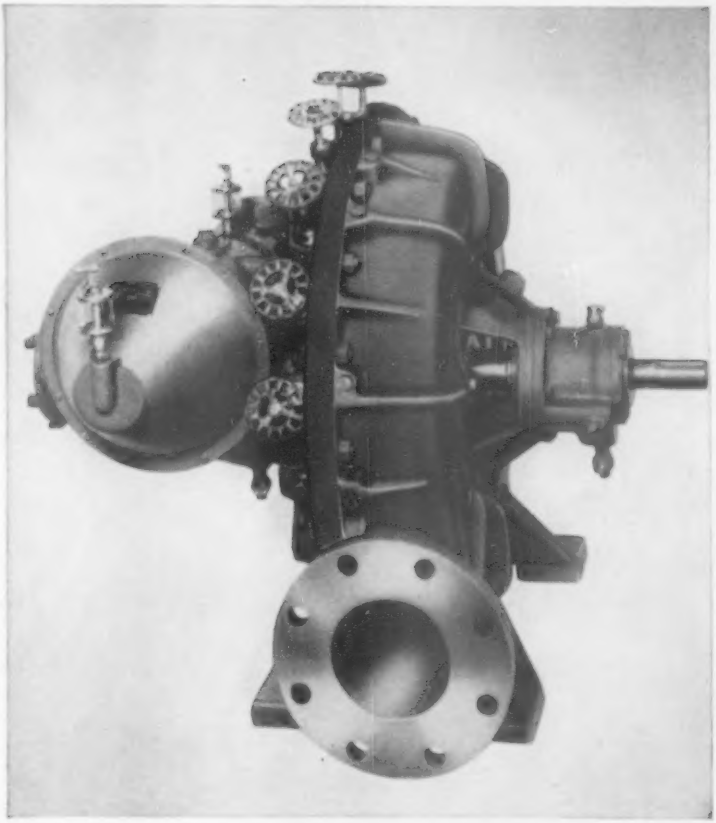
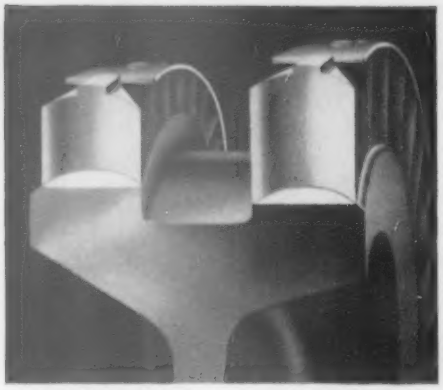


This is the reliable Coppus Turbine furnished with either type of wheel



Wide bucket "L" type wheel

Regular type wheel

Top performance in all COPPUS TURBINES

Both the regular type wheel or wide bucket "L" type wheel give you Coppus proven high quality and low maintenance cost. The "L" type wheel is the new development for use where low water rate is essential.

Coppus "Blue Ribbon Turbines" earned their fine reputation right on the job. Users vouch for their top quality performance and their low maintenance cost.

In the words of the supervisor of a large chemical company: "Coppus turbines require so little maintenance that a person would starve to death, if he depended on it for a living."

Proven features of *all* Coppus Turbines:

- Turbines rated close to your hp requirements, from 150 hp down to fractional. No need to buy a bigger, costlier turbine than your conditions call for.
- A larger number of steam nozzles, controlled individually by manually operated valves.
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- Replaceable cartridge type bearing housings.
- Optional carbon ring packing glands.

Coppus Steam Turbines ranging from 150 hp down to fractional, in 6 frame sizes, *make turbine dollars go farther.* Send for Bulletin 135 on Coppus Turbines.

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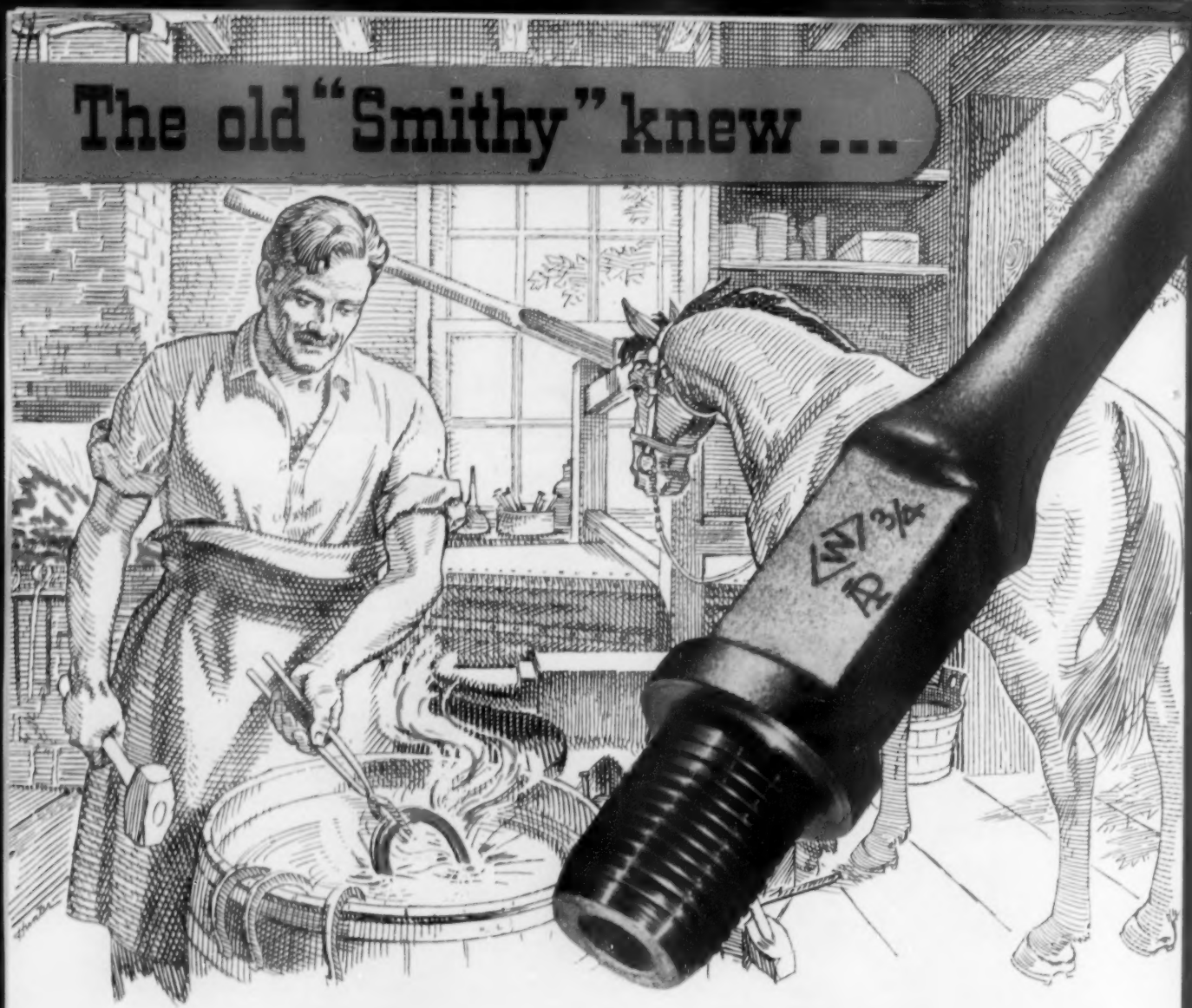
Sales offices in THOMAS' REGISTER

COPPUS "BLUE RIBBON" TURBINES

The old "Smithy" knew ...



LIQUID QUENCHING makes steel STRONGER!

MODERN INDUSTRY uses this time-proven principle where the ultimate in strength and endurance are required. "Oilwell" uses it to make sucker rods last longer and carry higher loads.

No slower cooling method so completely captures the fine grain and optimum properties of alloy steels. Liquid quenching makes possible both strength to carry load and toughness to resist fatigue, while improving resistance to corrosive attack.

Three grades of "Oilwell" rods are scientifically liquid quenched—"T," "Y" and "W." These grades vary in alloy content and consequently in price, but each has an application to specific service conditions. They are shown in the Sucker Rod Comparison Chart which we will be glad to furnish without cost upon request.

"Oilwell" liquid-quenched sucker rods cost you no more than comparable grades of other makes which do not have the advantage of this extra step in heat-treatment . . . an advantage that has been field proven in thousands of wells.

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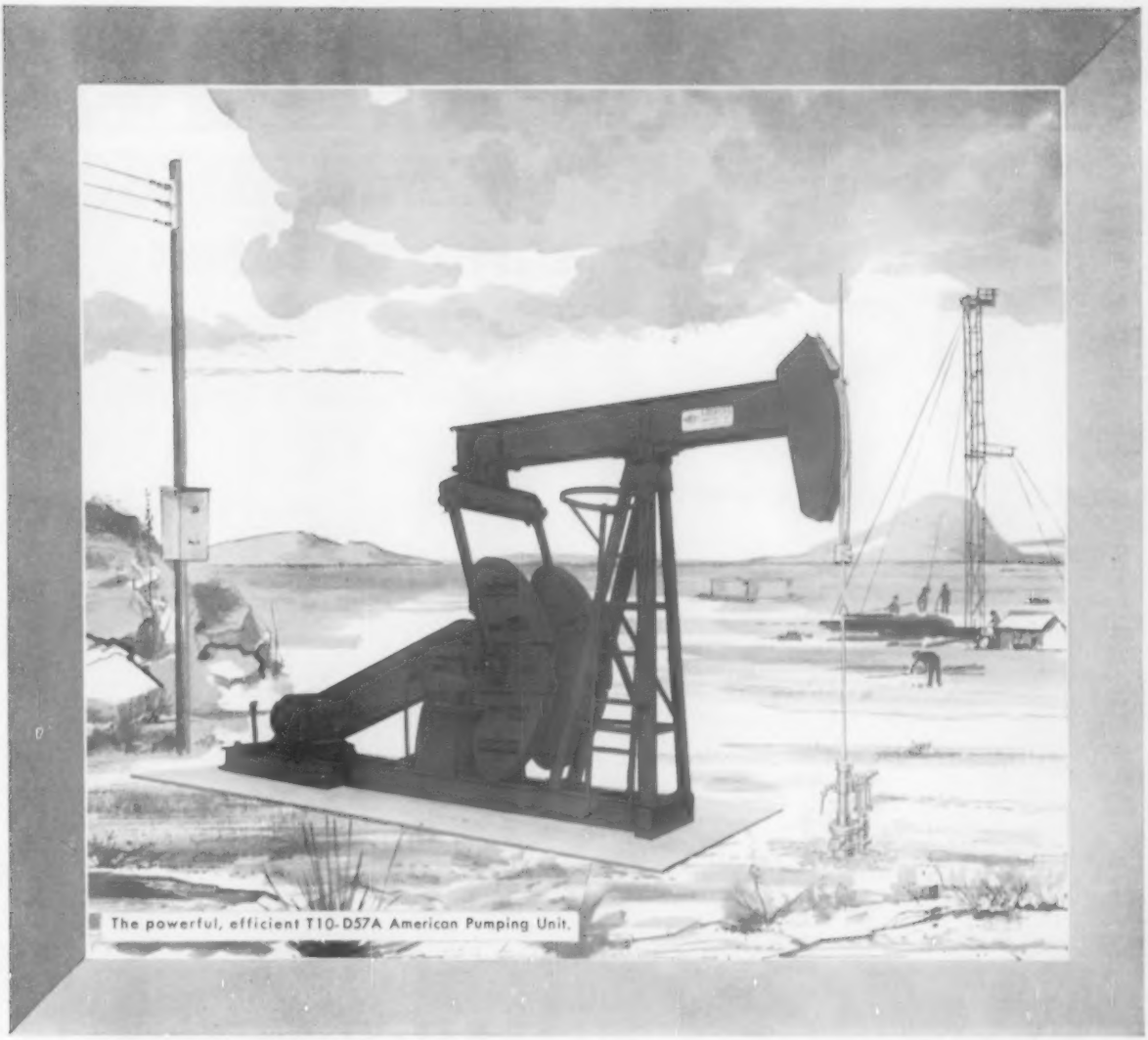

The powerful, efficient T10-D57A American Pumping Unit.

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And the reasons why American Pumping Units last longer, cost less to operate are very simple. First, they are built ruggedly, designed perfectly . . . to give you *more service with less servicing*. And, second, every American Pumping Unit in the field is checked by trained American service crews periodically. These field men keep detailed service records on your units . . . offer maintenance suggestions . . . help you get the longest, most economical service from your American Pumping Units.

Put hard working American Pumping Units to work on your wells and you'll agree, it costs less to pump with an AMERICAN. Try it!

For further information, contact your favorite supply store or nearest American office

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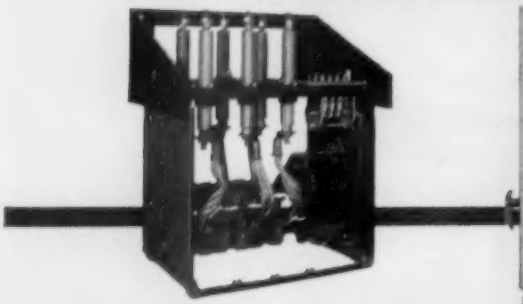
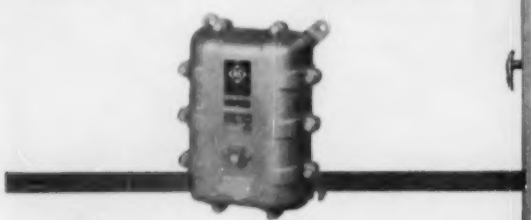
These Safety Features

meet operating demands of combustible atmospheres



Oil-immersed main contactor for safe operation

The complete contactor, including magnet and auxiliary switches, operates under oil to prevent sparks from igniting atmosphere and to protect mechanism from corrosion.



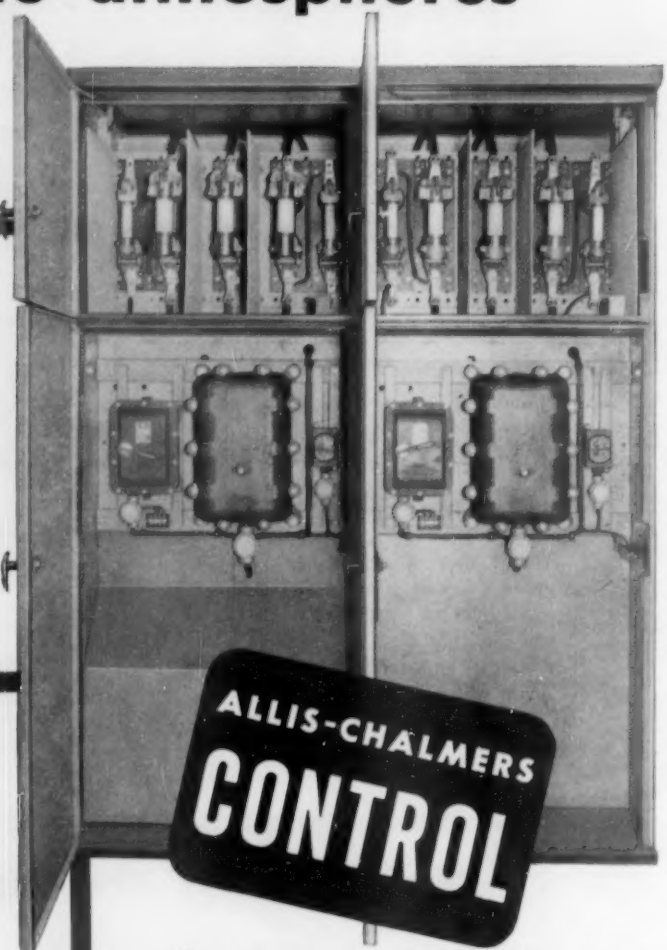
Relays and switching devices in explosion-proof cases

Further protection against the possibility of explosion is provided by NEMA VII enclosure which houses all overload, undervoltage, timing and auxiliary control relays as well as other low voltage switching devices.

Interlocked fuse compartment door

The fuse disconnect door is interlocked. The line contactor must be opened before access to the fuse is possible.

Other features *Steel barriers* in rear compartment prevent accidental contact with high voltage parts. Enclosure is finished with corrosive-resistant paint. Indoor or outdoor control equipment may be provided.



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Type H starters for 2300 to 5000-volt motors

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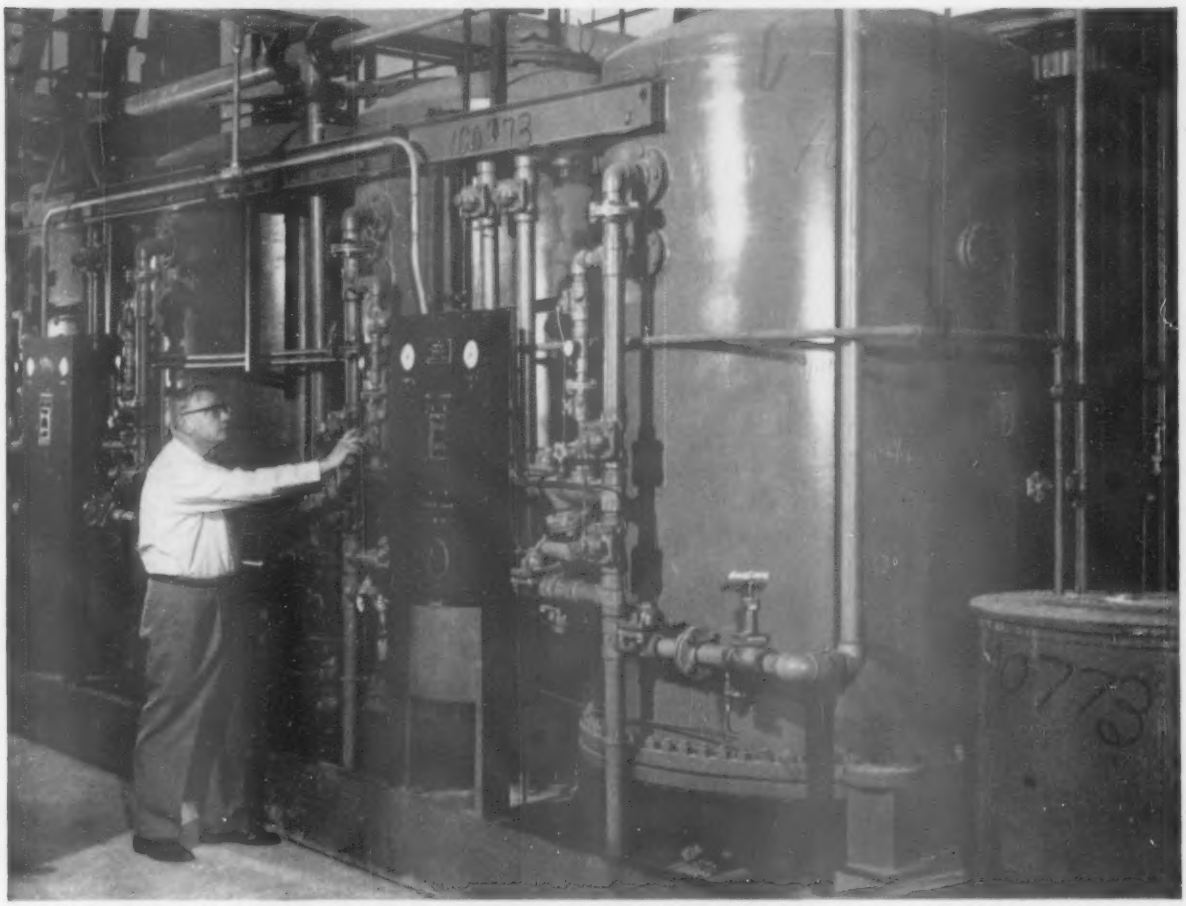

B. F. Goodrich Chemical Company does not make this pipe. We supply only the Geon resin.

Pipe Dreams come true with Geon Rigid Vinyl!

IF you've dreamed of cutting piping costs in half, listen to this: On a major piping installation, General Electric Appliance Park changed earlier planning and used pipe made from Geon rigid vinyl... results show a fine job at much lower cost.

This corrosion resistant Geon pipe carries deionized water at 300 psi in lines ¼" to 2". Fittings are made from Geon, too, by a new injection molding process that provides appreciably greater strength and dimensional accuracy.

Geon rigid vinyl piping costs much less, and in many cases proves more serviceable than high grade steel and alloys. It is light in weight, saves money in installation and changeovers. It resists acids, alkalis, oil and gas . . . has exceptionally high impact strength.

Geon polyvinyl materials make possible many economies and improvements, point the way to increased sales and profits. Geon materials are available in many forms for use in many products—upholstery, flooring, sponge, wire and cable insulation, and a host of others. To find how Geon can fit into your future, please write Dept. CG-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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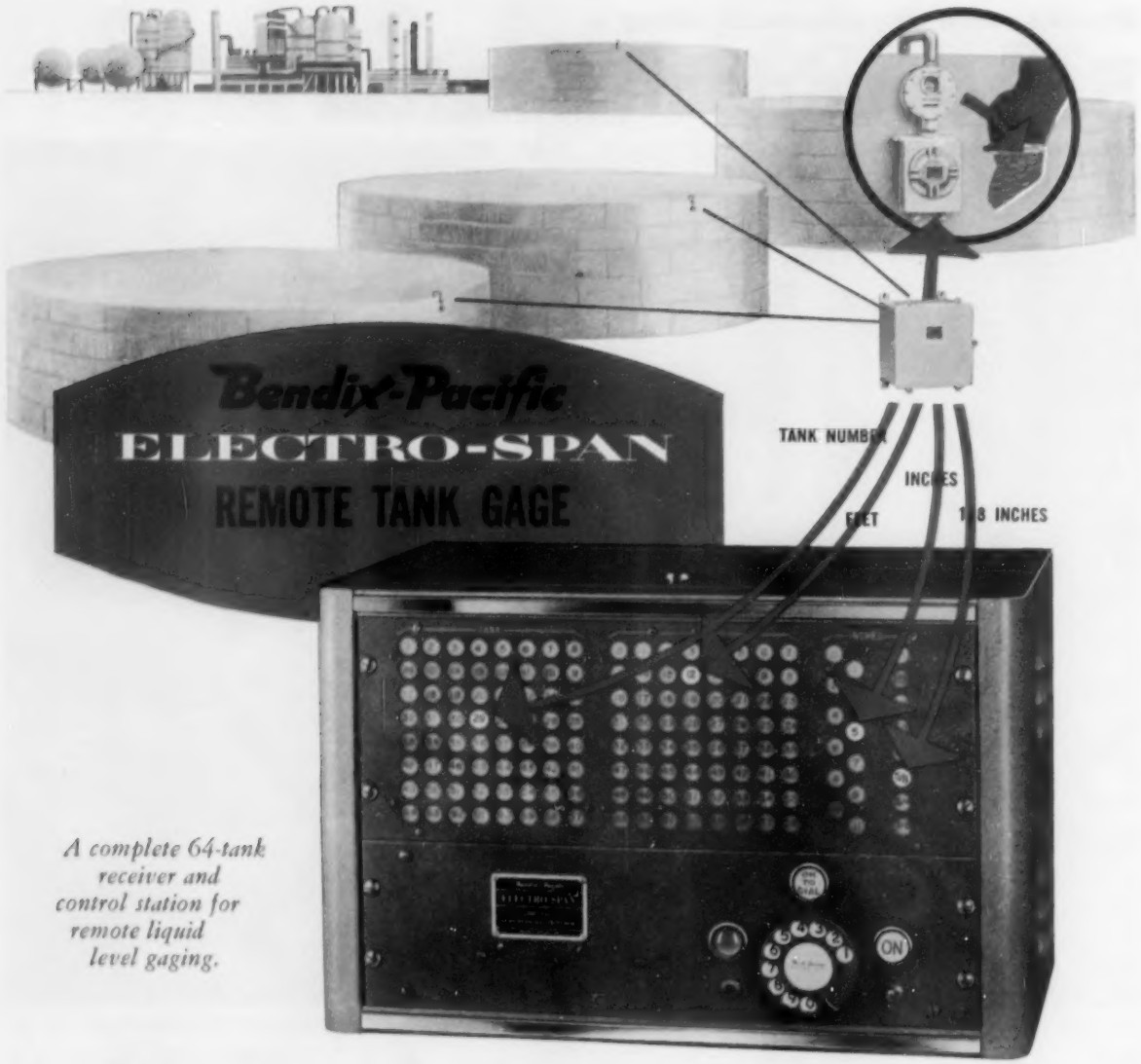

A complete 64-tank receiver and control station for remote liquid level gaging.

This new simplified digital gaging system remotely measures liquid levels in any number of tanks over a single wire pair of any length.

As illustrated, levels from the dialed tank are read from float-type gages and transmitted in precise digital form to the tank gage receiver. Tank number and level readings, in feet, inches and eighths, are displayed on easy-to-read lamp registers. Continuous monitoring or read-and-hold can be selected as desired. Optional features include automatic sequencing of tank selection, printed read-out by electric typewriter, and operation of card-punch apparatus.

Under the Bendix-Pacific unitized construction, these systems are comprised of standard assemblies offering maximum flexibility with low cost. Utmost reliability, freedom from error, and long-term unattended life are inherent qualities of the ELECTRO-SPAN system.

Engineering facilities are available for application of ELECTRO-SPAN to your specific requirements. Your inquiry is invited.

Please address inquiries to: Dept. 831

Pacific Division
Bendix Aviation Corporation
NORTH HOLLYWOOD, CALIF.

THE NAME **Bendix** AVIATION CORPORATION MILLIONS TRUST

A Primer of Gas Turbine Engines

What is the man above holding?

He is holding a Solar "Mars" gas turbine engine. Its power output runs to 50 hp, but it weighs less than 100 lb and is smaller than a two-foot cube. It achieves this remarkable power-to-size ratio by running at a high speed: the shaft in this engine turns at 40,000 rpm!

Where are gas turbine engines being used?

Gas turbines today are finding an increasing variety of uses: in boats, where compactness is important; in airplanes, where light weight is essential; in remote pumping stations, where portability counts; in electric power plants, where reliability must be assured.

What advantages do small gas turbines offer?

Gas turbines are extremely light and compact; they permit smaller space envelopes and easy transportation, so important in such applications as portable fire pumps and airborne generator sets (photo above). Gas turbines are simple and rugged, with low maintenance cost. They need no cooling system and will operate on a variety of fuels. Low initial cost is anticipated, when gas turbines reach volume production.

What gas turbines are made by Solar?

Today in addition to the 50 hp Mars gas turbine, Solar is producing the 500 hp Jupiter gas turbine (photo above). Its weight installed is under 900 lb—less than one fourth that of a comparable diesel engine!

Mars engines have been adapted to many applications such as fire pumps, starter carts, and welding equipment, and they are in volume production for auxiliary generator sets used on the Douglas C-124C and Lockheed C-121C. Both constant speed Jupiter engines for generator sets and variable speed engines for ship propulsion have been built for the U.S. Navy.

Solar gas turbines are not yet generally available as all current production is going into military uses. Field testing of commercial applications is underway and production for civilian use is anticipated in the near future. Further information is available on request.

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AIRCRAFT COMPANY
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This is What Solar Offers You

Solar specializes in the manufacture of precision products from alloys and special metals for severe service. Solar's experience since 1927 is unduplicated in this field. Solar skills and facilities range from research, design and development through to mass production. Wherever heat, corrosion or difficult specifications are problems, Solar can help you solve them.

PLANTS. *In San Diego and Des Moines (photograph above). A total of 1,400,000 sq ft of floor space. Approximately 5,000 employees. Annual sales over $65,000,000.*

EQUIPMENT. *Production equipment for all types of metal fabrication—forming, machining, welding, brazing, casting, coating. Extensive laboratory and testing equipment. Facilities for development, prototype, limited or mass production.*

SERVICES. *Research, design, development, tooling and production engineering staffs. Experienced with all alloy steels, stainless alloys, super alloys, and titanium and its alloys. Government source inspection and Solar quality control meet rigid aircraft and commercial standards.*

CONTRACT PRODUCTION

Current orders include aircraft engine and airframe parts, alloy castings, pneumatic ducting, atomic energy components. Customers include some of the most honored names among aircraft and industrial companies in the U.S. and Europe.

SPECIAL PRODUCTS

Bellows. *"Sola-Flex"® bellows and expansion joints in many designs from ½ in. up to the world's largest, 28 ft in diameter.*

Gas Turbines. *Solar "Mars" 50 hp engines for auxiliary generator sets, ground carts, portable fire pumps; Solar "Jupiter" 500 hp engines in variable and constant speed models.*

Ceramic Coatings. *"Solaramic"® is the Solar trade mark for a family of coatings that protects metals from heat, corrosion, galling and abrasion.*

Controls. *Complete control systems utilizing the new Solar "Microjet"® principle for control of gas turbines, jet engines and pneumatic devices.*

FURTHER INFORMATION
Your inquiry regarding any Solar service or facility will receive prompt attention. Address
Solar Aircraft Company
Department A-87
San Diego 12, California

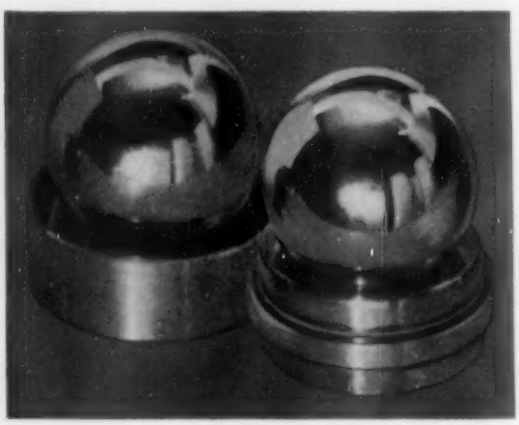
This is trouble...

A seat and ball must have metallurgical stamina and the two must have mechanically perfect mating. If not, the photo shows what happens. Fluid under extreme pressure, containing corrosive, abrasive and other foreign matter, will cause fluid cutting of the seat and disintegration of the ball. A wrong specification of parts for a specific well condition might well be the cause of this failure.

Believe it or not, seat and completely split ball from a pump in a West Texas field. Photo unretouched.

This is trouble-free...

Here's why . . . Design, metallurgy and manufacturing, each are vital factors in the Axelson end product. Each micro-finished ball is precision fit to each of the two precision-ground seating surfaces of the seat. Seat and ball become a matched pair. For your further protection, an Axelson expert is at your service to analyze your well condition and recommend the correct combination of Axelson pumping equipment.



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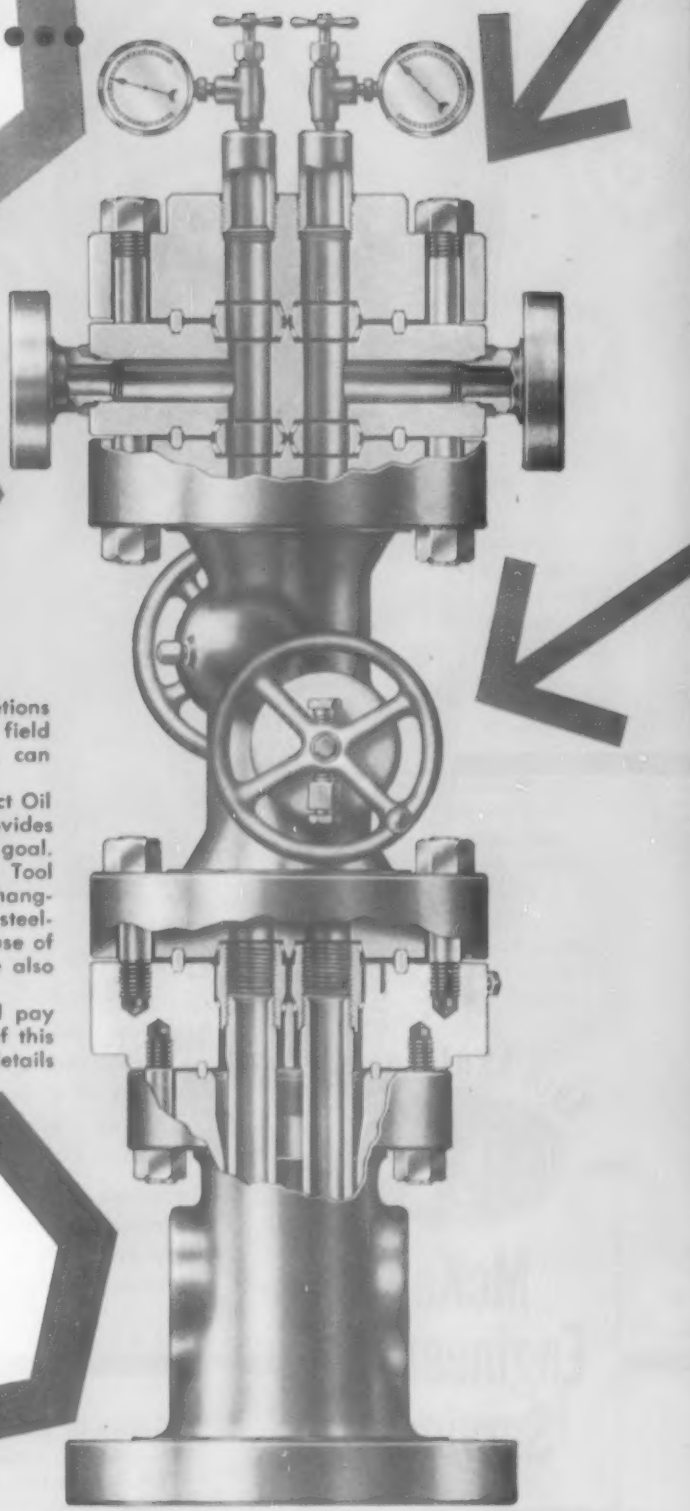
If you make a DUAL COMPLETION...



MAKE IT O·C·T

FROM AN ECONOMIC STANDPOINT, dual completions provide the industry with substantial savings in any field where conditions are such that dual completions can be accomplished.

FROM AN EQUIPMENT STANDPOINT, this compact Oil Center Tool Company Christmas Tree assembly provides a safe, strong and practical means to the economic goal.

In developing this dual assembly, Oil Center Tool Company presents these new features: 1. a special hanging and sealing flange on top of the tubing head; 2. steel-to-steel seals throughout the assembly through the use of Flex-Float steel rings. Standard API ring joints are also used as a seal from the atmosphere.

If you are considering dual completions, it will pay you to check these features and get the full story of this new O-C-T Dual Completion Assembly. Write for details or ask your nearest O-C-T Representative.

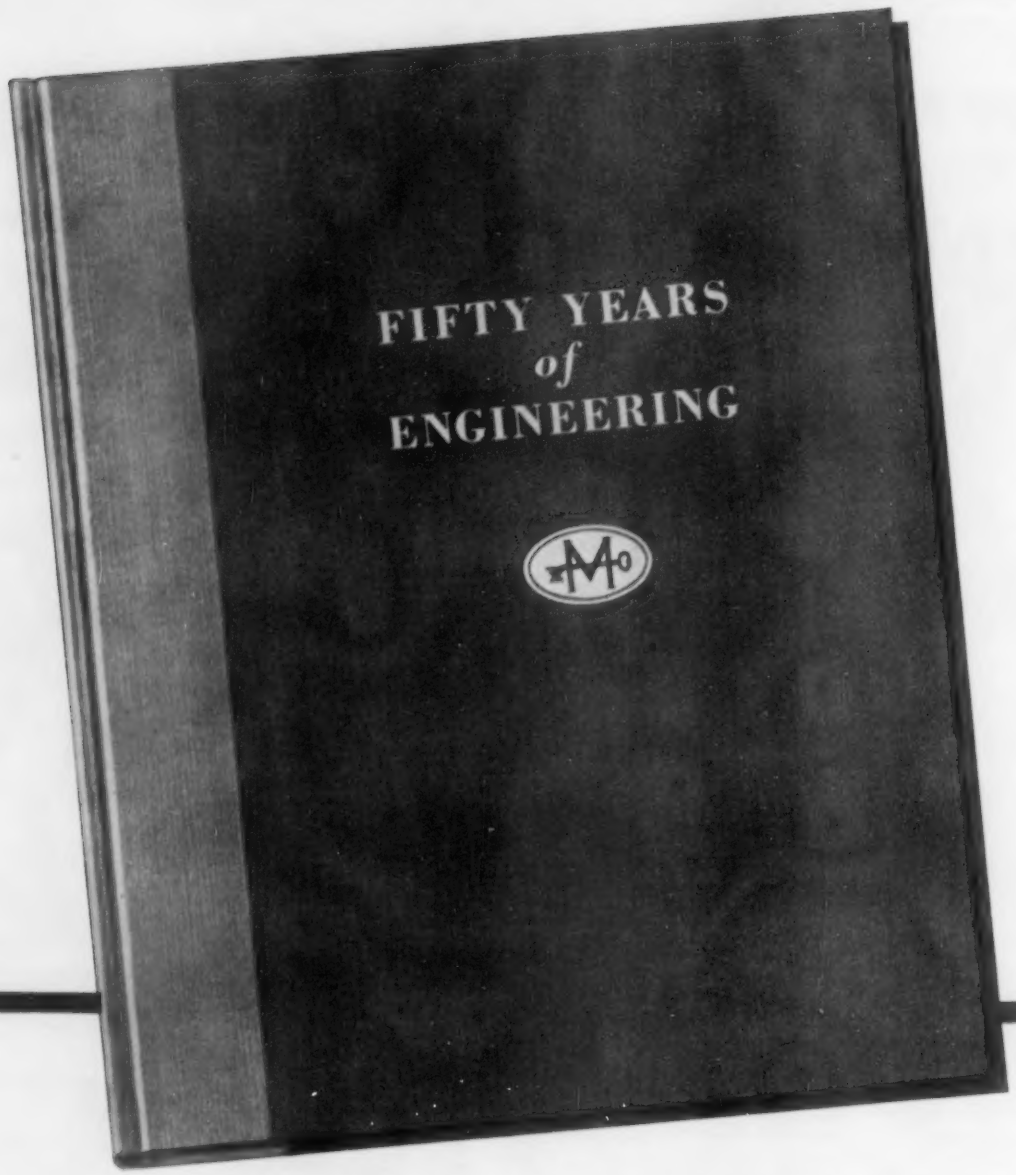
O·C·T

OIL CENTER TOOL CO.

P. O. Box 3091, Houston, Texas

Expert Representatives: Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. South America—East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

Dual Completion equipment was pioneered and introduced FIRST by O-C-T as early as 1941



THE YEAR 1955 marks the Fiftieth Anniversary of the founding of Arthur G. McKee & Company.

Since 1905 this company has had a continuous, successful record of fifty years of engineering, designing, building in every quarter of the globe—fifty years of accumulating knowledge and experience—fifty years of building an organization with the specialized abilities, the scope and resources to undertake projects of any size in any location.

The sound, practical engineering methods and thorough, painstaking construction techniques developed in a half-century of McKee history can be invaluable to you on your new plant project, as they have been to hundreds of McKee clients in the past.

50th ANNIVERSARY

McKee Engineering Services

Arthur G. McKee & Company • Engineers and Contractors

Headquarters: McKee Building • 2300 Chester Avenue • Cleveland 1, Ohio
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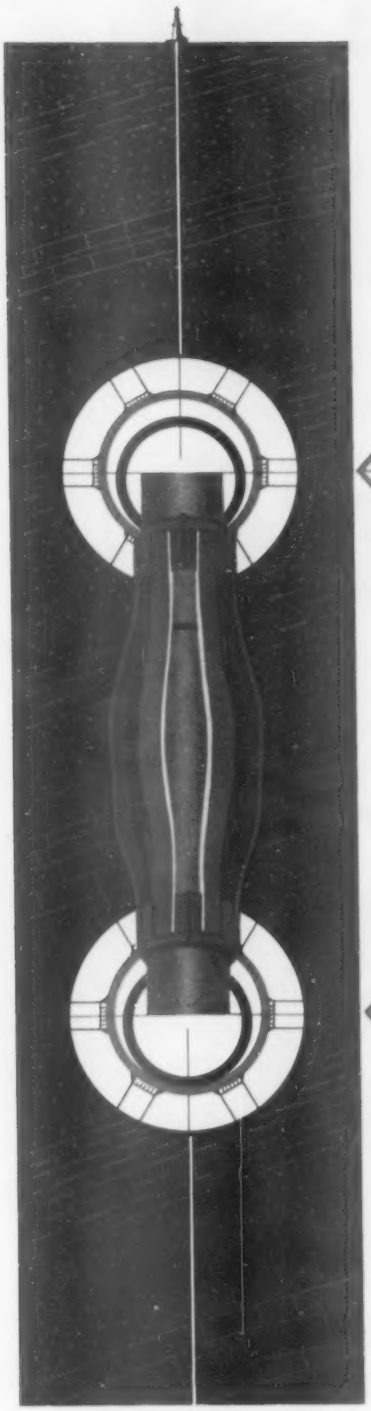


MORE CENTERING FORCE

...AT 8,000′ OR 18,000′

with HALLIBURTON'S

S-3

CASING CENTRALIZERS

There's more uniform cementing and maximum casing protection wherever needed, *at any depth*, built into the rugged S-3 Casing Centralizers. With heavier load-tested springs and a design that prevents these protecting springs from touching casing, the S-3 provides more centering force at every point to TD!

Even after completely deflecting each spring 25 times, loss of bowed height was only 3.94% in smaller sizes to 8.2% in larger sizes—much less than other centralizers. This greater deflection resistance explains the S-3's ability to run through key seats, extreme deviation and tight spots with less loss of centering force or cementing efficiency. The centering load is directly transmitted to the sturdy end bands which reduces torque on rotating or reciprocating casing to less than that of so-called "free hanging" casing.

For a better cementing job and for free rotation of casing without damage to sidewalls, specify the Halliburton S-3 Centralizer for your next job. You'll be sure of getting the extra advantages of faster installation, freer circulation in the annulus and the strength of lap welding *without* extra cost. A helpful bulletin on Casing Centralizers and complete spacing guide charts is now available. For your free copy, call your local or district office of the Halliburton Oil Well Cementing Company.

HALLIBURTON

CEMENTING EQUIPMENT

211 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

CSCO

CSCO Pumping Engines are available through Supply Stores other than Continental.

CSCO ACCESSORIES

- Starters — Gas and Electric
- Low-Water Shut-off Switch
- Automatic Gas-Gasoline Control
- Oil Pressure Safety Switch
- Fuel Metering Valve
- Volume Tank
- Plastic Magneto Cover
- Oil Filter Kit

The Only PUMPING ENGINE with ALL 4 MOST-WANTED FEATURES

No other pumping engine embodies *all four* of the time and money-saving features found in a CSCO.

The reason is easily understandable: The CSCO was designed and engineered specifically for oil well pumping. The exact requirements of the oil industry were the basic considerations.

Thus easier maintenance and smoother operation results in greater economy. Costly shut-downs are held to a minimum. In fact, a CSCO can be *completely renewed* on the location!

Check with your Continental man and you'll have the best and most dependable pumping engine working for you . . . the money-saving CSCO — *initial cost and operating cost!*

1 **EASY and SAFE TO START** . . . CSCO Engines were designed for oil well pumping and of top engineering importance was easy and safe starting. This is possible through exclusive CSCO features.

2 **EASY TO SERVICE** . . . There's no need to stop a CSCO to check oil level . . . to add oil . . . to check water level . . . or to add water. Less shut-down for servicing.

3 **EASY TO REPAIR** . . . CSCO parts needing repair or attention can be removed with a minimum of disturbance of adjacent parts or assemblies. CSCO design embodies unit assemblies . . . each accessible, quickly and easily.

4 **SMOOTH, STEADY OPERATION** . . . The CSCO flywheel inertia provides peak power while the oil damped governor holds the throttle steady — permitting the engine to average the power up to its full capacity.

THE CONTINENTAL SUPPLY COMPANY
General Offices: DALLAS, TEXAS

CONTINENTAL

Serving the Oil and Gas Industries

Cut Rig-Up Time

WITH

AEROQUIP FLEXIBLE HOSE LINES and SELF-SEALING COUPLINGS

The ease with which fluid-carrying lines can be installed, connected and disconnected makes the big difference in rig-up time and tear-down time. You can save time on these operations with two Aeroquip products:

FLEXIBLE HOSE LINES eliminate alignment problems, install in a fraction of the time required to fit rigid piping. Aeroquip hose lines can be made right in the field because fittings are detachable and reusable.

SELF-SEALING COUPLINGS provide quick connection and disconnection of fluid-carrying lines even when they are under pressure. No fluid gets out . . . no air gets in.

Get these time-saving Aeroquip products at your supply store, or write us for information.

This fuel storage tank, owned by Union Rotary Corporation, of Mt. Pleasant, Mich., is equipped with three self-sealing couplings and Aeroquip hose lines. The tank can be removed without draining the tank or fuel lines.

Aeroquip

REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

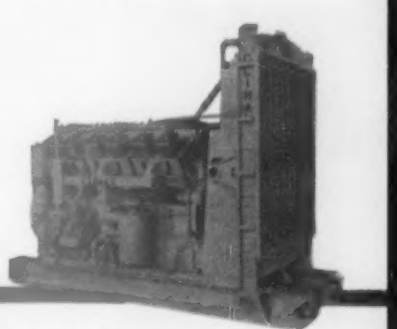
Positive Power

When positive power is needed 24 hours a day every day of the year, Climax Blue Streak Engines deserve first consideration. Dependability, economy, and a well established reputation have brought Climax Engines to their present leading position as power suppliers for oil and gas installations. The two Climax V-122's shown above are each driving a compressor for Republic Natural Gas Co. on their O'Connor lease, producing 1,500,000 cubic feet of gas per day, every day. On the coast, in the mountains, or on the plains, you'll see these Climax Blue Streak Engines operating efficiently throughout the oil country.

There is a Climax distributor near you. Call him for details for your power problem.

WHERE POWER IS YOUR PROBLEM CLIMAX IS THE ANSWER.

climax BLUE STREAK ENGINES



CLIMAX ENGINE AND PUMP MFG. CO.

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FACTORY
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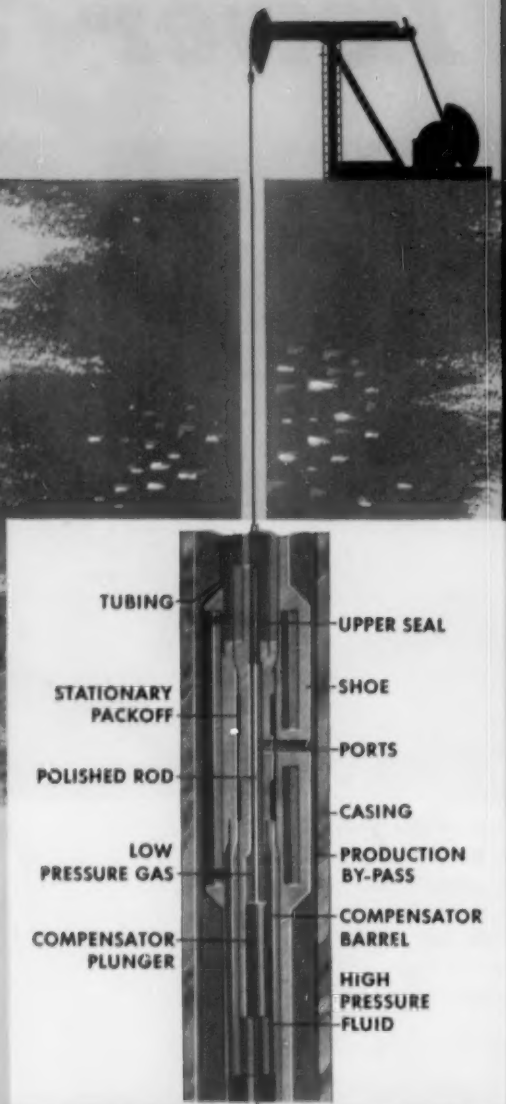
El Paso, Texas Salt Lake City, Utah

SOMETHING FOR NOTHING

sounds mighty appealing, but like "lifting yourself by your bootstraps," it is in violation of the basic laws of science. Therefore, when we first told oil men how much weight reduction could be expected from a Rod Weight Compensator, they were skeptical and started calling the Compensator "Operation Bootstrap." That was when "Bootstrap Joe" came into being and we like to think of him as symbolic of the mighty upward thrust delivered midway down the rod string by the application of the hydrostatic pressure on the Compensator plunger.

But now the story has changed. Operators have witnessed installation after installation where the dead weight of the sucker rod string has been reduced by 33%. Now they are telling us it isn't "Operation Bootstrap" at all — that a Compensator is actually a two stage counterbalance with part of the rod load balanced out half way down the well. Others tell us we have placed an upside down pump in the middle of the rod string, and the lower pump only moves the fluid to the Compensator on the upstroke, while the Compensator boosts it to the surface on the downstroke.

We still like to believe in "Bootstrap Joe," but we don't argue. We do know that an Oilmaster Rod Weight Compensator permits more oil to be produced from greater depths than any other known means of sucker rod pumping. If deep well pumping is your problem, we suggest you get in touch with your Oilmaster Representative for further details on the...



oilmaster PUMPS FOREMOST IN THE INDUSTRY

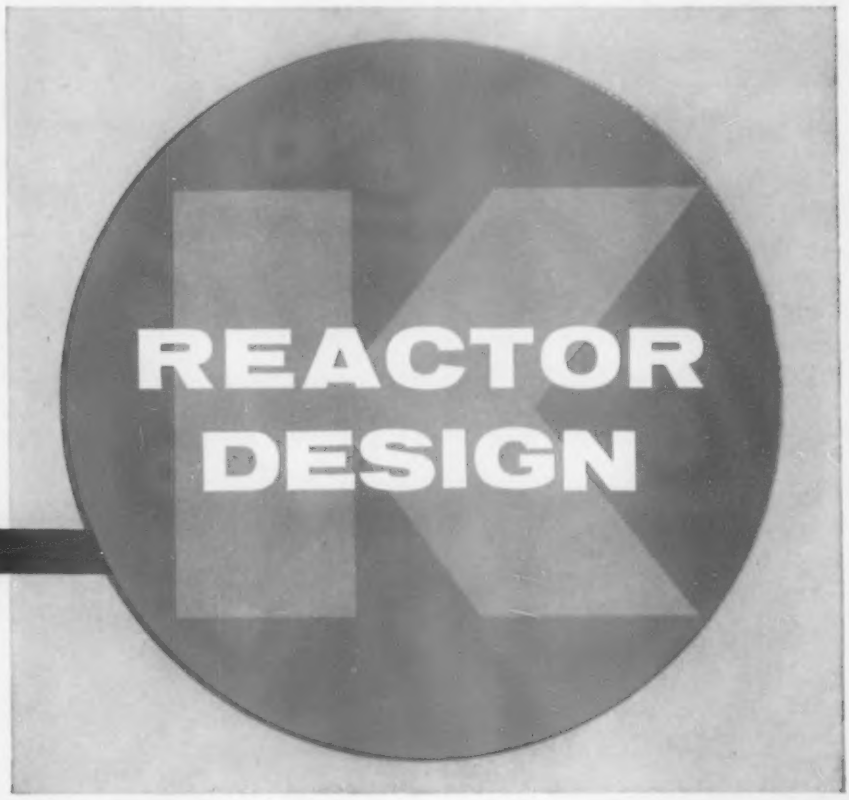
oilmaster ROD WEIGHT COMPENSATOR

U.S. Patent No. 2687697

FLUID PACKED PUMP COMPANY, P. O. Box 64 • Los Nietos, California

Main Office and Plant, Los Nietos, Calif. • Dist. by the National Supply Co., Pittsburgh, Pa. Export: The National Supply Co., Inc., Export Division 600 Fifth Avenue, New York • Co-Distributors: Berry Supply Store, Beacon Supply Co., Industrial Supply Co.

FOR INCREASED AMMONIA DEMANDS



KEY TO HIGHER YIELDS—LOWER COSTS

IN THE PRODUCTION of ammonia, The M.W. Kellogg Company offers a number of processes for the generation and purification of synthesis gas—depending on the starting material and other local economic conditions. For the conversion phase, however, it is the Kellogg-developed, quench-type reactor which can contribute the most to increased plant capacity.

Assuring extremely accurate and flexible control of the temperature inside the catalyst mass, the Kellogg reactor eliminates the "hot spots" which cannot be averted with the conventional catalytic basket equipped with tubular heat exchangers. This in turn means, for any production rate, the gradient of temperature which gives the highest possible yields of ammonia per pass.

Capacities per day in excess of 300 tons per unit are now entirely practical with the Kellogg reactor. One such plant now being built by The M. W. Kellogg Company will have the unusually low investment cost of about fifty dollars per ton of annual capacity.

Your inquiries on ammonia or other proposed petrochemical projects are cordially invited.

M KELLOGG W

PETROCHEMICAL PROCESSES AND PLANTS

CHEMICAL PROCESS DIVISION

THE M. W. KELLOGG COMPANY, 225 BROADWAY, NEW YORK 7, N. Y.

The Canadian Kellogg Company, Limited, Toronto • Kellogg International Corporation, London

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It costs so little more to "go first class"

. . . and
UNIBOLT
flow manifolds
give you so much more
for your money

Pressure-tested as a unit and available in a full range of pressures:

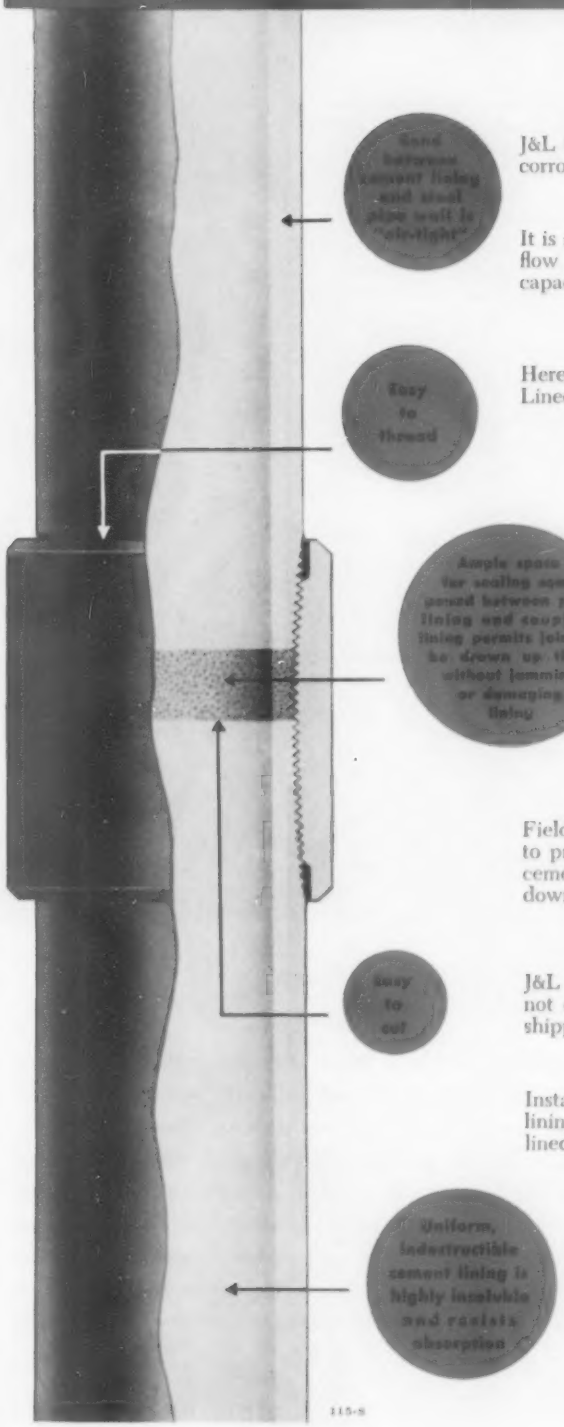
3000 lbs. w.p.
5000 lbs. w.p.
10000 lbs. w.p.

and in "SA" stainless steel for corrosive conditions.

● No exposed threads, concealed seat in groove . . . no accidental damage. ● All metal seals . . . not affected by high or low temperature. ● Lubricators, bottom hole pressure adapters, and valves easily attached to Unibolt Tee. ● Tee cannot be accidentally opened. ● Unibolt stronger than tubing threads . . . ideal for working trees with welded lift nipple. Tubing threads in Tee if desired. ● Wing Valve requires no grease to effect seal. ● Variable opening speeds up initial clean-up or running initial flow tests . . . saves rig time. ● Unrestricted 1" opening in Wing Valve will pass 10,000 bbls. fluid per day with 100 lbs. pressure drop. ● Valve stem packing needs no tightening . . . stem turns freely under high pressures. ● Threads on stem not exposed to internal or external damage . . . full 2½" pilot for true stem alignment and rigidity. ● Stem seat sealed by power threads and metal gasket assures alignment. ● Nitride hardened stem and stem seat . . . resists corrosion. ● Choice of hard chrome plated or "SA" stainless stems and seats. ● Positive Choke Body takes regular or "X" Beans . . . all beans flow-rated. ● Shaped entrance on beans prevents paraffin clogging. ● Positive Choke Body may be replaced with inexpensive tee and cage nipple, or can be converted to Adjustable Wing Valve by substituting two parts. ● Streamlined flow . . . no obstructions . . . no turbulence.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

J&L CEMENT LINED CASING, TUBING, LINE PIPE



USES-ADVANTAGES

J&L Cement Lined Steel pipe is designed specifically for handling corrosive liquids.

It is satin smooth, resulting in a lower friction coefficient and higher flow efficiency than for unlined pipe. Therefore, the carrying capacity is greater than steel pipe of the same I.D.

Here are a few of the many applications in which J&L Cement Lined Steel pipe offers outstanding advantages:

1. Lines in salt works for handling brine.
2. Lines in process plants where water or other liquids must be kept free from iron contamination or rust.
3. Oil field flow lines, pipe lines, tubing and casing, where salt water, hydrogen sulfide, carbon dioxide and other corrosive materials are present.
4. Lines in paper and pulp mills for handling diluted acids and corrosive waste liquids.
5. Discharge lines in coal mines for carrying highly corrosive sulphur water.
6. Hot water lines where ordinary pipe is subject to tuberculation.
7. Municipal water works systems.

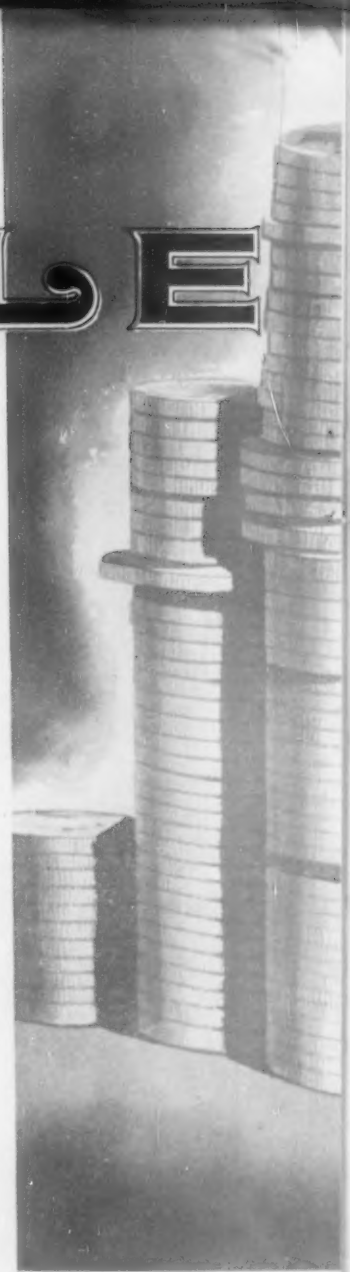
Field joints are made up with a putty-like sealing compound, easy to prepare and use. It affords protection at this point equal to the cement lining in the pipe. Field joints can be made up and broken down as often as necessary without damage to the cement lining.

J&L Cement Lined Pipe will withstand any exterior blow that does not dent or deform the steel. It requires only normal handling in shipping and unloading.

Installation requires no special knowledge or skill. The pipe and lining can be cut with a metal saw, or a power bandsaw. Cement-lined tees, ells, crosses, unions, and other fittings can be supplied.

Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION—TULSA, OKLAHOMA
Serving The United States and Canada

GAMBLE



THE GAMBLERS of the great gambling casinos of the world are pikers compared to these four players. They gamble against odds that make the odds of Reno, Las Vegas, and Monte Carlo pale into insignificance by comparison.

But no gamblers ever try harder to take the gamble out of their work than these four players. Their odds are the vagaries of nature. Their skill in meeting the odds depends on science, engineering, invention. P.E.S.A.'s nine thousand engineers and the engineers of their great customer, the oil-producing industry, work around the clock to reduce these odds.

These four players are:

P.E.S.A. Manufacturers venturing their capital to make better tools and equipment to stand the extreme pressures, abrasive cutting, shock, and mounting temperatures necessary to keep the wells going to three-mile depth and beyond.

P.E.S.A. Supply Companies venturing their capital to assure oil operators getting ALL the equipment necessary for carrying on oil field operations *when* they want it and *where* they want it.

P.E.S.A. Service Companies venturing their capital in order to carry on expensive basic research necessary to solve the highly technical problems connected with much oil field service; in order to develop and construct the equipment necessary to adapt theory to practice; in order to provide the highly skilled scientists, engineers and technicians necessary to perform the services and to lend their know-how, integrity, and sincerity of purpose, to help analyze well problems and recommend effective, economical solutions.

Oil Companies venturing their capital to obtain oil leases; to apply geology and geophysics to finding favorable formations; to spending great sums of money to find if oil-bearing formations exist, and then to provide the large amount of money necessary to bring the oil out of the ground and transport it to the refineries.

• • •

There are no greater gamblers than the intrepid, risk-taking pioneers who have developed the oil industry into one of the world's greatest and most important businesses. They take risks, but they are calculated risks based on all the scientific knowledge that brilliant men can bring to bear on problems connected with exploring and operating in the depths of the earth. The depletion allowance is recognition of this risk and is a necessary incentive. The aggressive venturism of hardy men also finds its reward in being able to operate under the American free-enterprise system. That's the secret of America's greatness.

MANUFACTURER
SUPPLY
SERVICE

P.E.S.A.*

* Petroleum Equipment Suppliers Association

Composed of: manufacturers whose plants make the finest precision equipment . . . *supply stores* who add two other ingredients of value — where you want it — when you want it . . . *service companies* who make available to their customers the practical results of the theoretical research of some of the most brilliant scientific and technical men in the world.

and still...

You can do it CHEAPER with

UTILITY *Electric Power*

wherever power is needed...

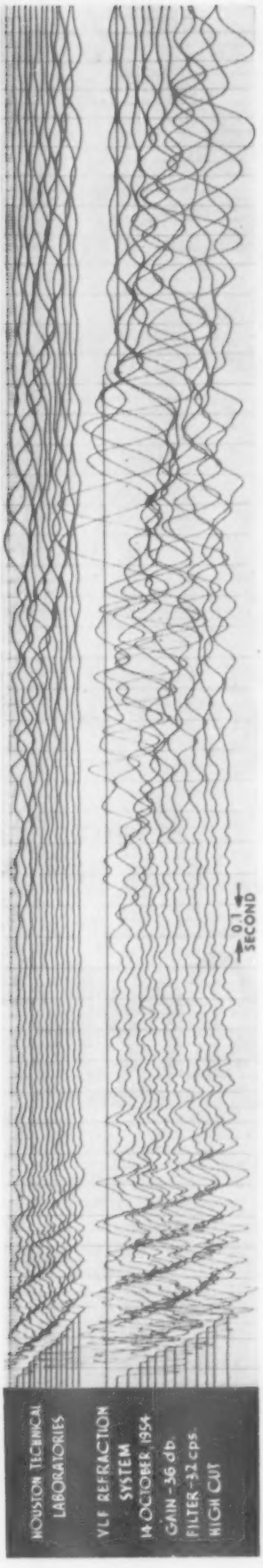
your Electric Power Company will get that power to the job... with UNINTERRUPTED SERVICE... through mud, snow, sleet, ice and swamp, etc. Utility Electric Power is still the MOST MODERN, DEPENDABLE, EFFICIENT AND ECONOMICAL power you can buy. Be sure you have power, when and where you need it... but make it Utility Electric Power.

Petroleum Electric Power Association

CALL YOUR LOCAL ELECTRIC POWER COMPANY FOR POWER FACTS

P. O. BOX 2771, DALLAS, TEXAS

ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY.



for fast thorough large area surveys, use the

VLF

2-CYCLE refraction system

especially designed for refraction work by HTL

The new Houston Technical Laboratories VLF (very low frequency) seismic refraction system is especially useful in areas unworkable with the reflection method. The VLF refraction system can be used in petroleum exploration, mining surveys, civil engineering, and ground water location and is capable of covering large areas quickly.

With excellent frequency response down to one cycle on the amplifiers and to two cycles on the seismometers, the VLF refraction system is exceptionally versatile in application. A combination of high cut filters provides a frequency cut-off range from 8 cps to 48 cps — low enough for good refraction work at extremely long ranges, yet high enough for all applications except those at extremely small ranges. Excellent first breaks have been received at a distance of five miles using only a five pound charge.

Portability of the new VLF system is achieved through compact design of the 12-channel amplifier unit which measures 16¼ x 16⅞ x 8¼ inches and weighs only 42 pounds. Two output signals from each amplifier channel are recorded on a standard HTL RS-8 recording oscillograph, with paper speed adjustable from 7 to 16 inches per second.

TWENTY-FIFTH YEAR · HTL · GEOPHYSICAL INSTRUMENTATION

For detailed information about the new VLF seismic refraction system, write for Bulletin No. S-308.

HOUSTON TECHNICAL LABORATORIES

A SUBSIDIARY OF TEXAS INSTRUMENTS INCORPORATED

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Announcing a

GREAT
NEW
OIL WELL
CEMENT
AGGREGATE

designed for modern oil well completions

Strata-Crete 6, a new perlite aggregate, has 76% more fillup capacity than Strata-Crete. Consequently, the fillup cost of most **Strata-Crete 6** cement slurries is considerably less than the fillup cost of neat cement.

Strata-Crete 6 provides strong, lightweight concretes which are easily placed with normal pump pressures – a tremendous advantage in cementing slim holes, deep wells and in the new permanent-type completions. But **Strata-Crete 6** also brings operators many added benefits in regular completions. The light weight of **Strata-Crete 6** slurries, with their excellent bridging properties, increases the chances of complete fillup at normal pressures. And you get a better cement job – a more uniform concrete sheath with less chance of voids or shrinkage cracks, minimizing the possibility of channeling.

Strata-Crete 6 concretes have more than ample compressive strengths to prevent any casing movement. And when it comes to perforating, you get a better job there, because the greater resiliency of **Strata-Crete 6** concretes allows clean penetration with less cracking or shattering of the concrete sheath.

Availability of **Strata-Crete 6**? It can be obtained from your oilwell cementing service company. Write today for your "technical data."

Sales Representative in Rocky Mountain Area:
MUD CONTROL LABORATORIES, INC.

GLC ®

Strata-Crete

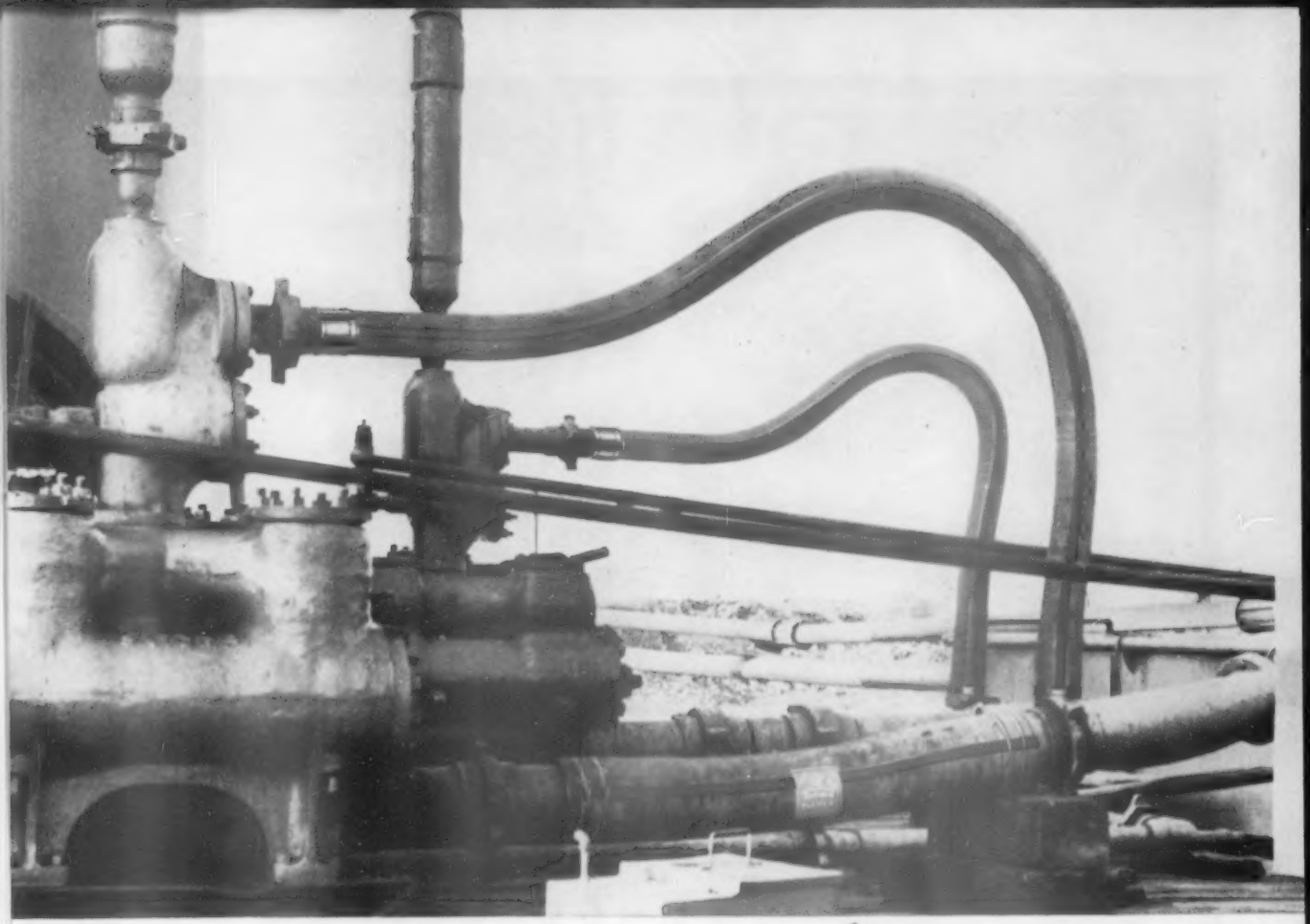
® TRADE MARK

6*

*Refers to gallons of water required per cubic foot of Strata-Crete 6.

GREAT LAKES CORPORATION

1204 PRUDENTIAL BUILDING
HOUSTON, TEXAS



Thermoid Oil Field Products Are Built for Rugged, Continuous Service ...to Cut Your Drilling Costs

Thermoid Flexible Discharge Units provide rugged high pressure connections between mud pump and standpipe . . . eliminate sharp angle fittings, thus reducing turbulence and loss of pressure. Easily installed, they take up misalignment, save rig up and tear down time, resist vibration, cut time lost due to pipe breakage and loosened connections. Full flow pressure seal couplings are built in. Supplied in diameters of 2½", 3" and 3½" . . . standard lengths. Pre-tested to 5000 psi to assure blowout-proof performance.

Thermoid Mud-Flo Suction Hose absorbs pumping vibration and affords maximum flexibility. Thick inner tube and heavy galvanized wire reinforcement imbedded in rubber compound prevents collapse and provides unobstructed flow. Permits changing position of intake without changing connections. Cover withstands abrasion and weathering. Ends are sealed to help keep out moisture.

To keep your costs down, be sure you specify Thermoid Flexible Discharge Units and Mud-Flo Suction Hose.

Mid-Continent Offices and Warehouse, Houston, Texas
California Offices and Warehouse, Los Angeles

Flexible Discharge Unit

Mud-Flo Suction Hose

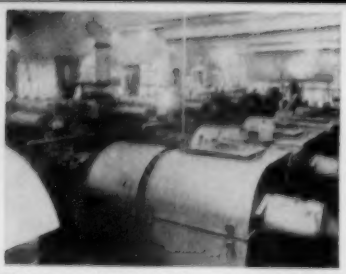
SEE OUR CATALOG IN THE COMPOSITE CATALOG

Thermoid

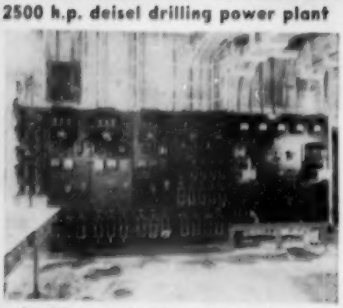
Powerflex Rotary Hose • Trioflex Slim-Hole Rotary Hose • Mud-Flo Slush Pump Hose • Flexible Discharge Units • F.H.P. and Multiple V-Belts • Oil Country Flat Belting

Wire Line Turn Backs • No-Wip Line Savers • Stuffing Box Rings • All Types of Hose • Molded Specialties • Brake Blocks

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah



2500 h.p. deisel drilling power plant



Auxiliary switchboard and draw works control panel

Christening Ceremonies

ALEXANDER COMMISSIONS

Another!

American Tidelands 101, deep water drilling barge designed and built by Alexander Shipyard, takes to the sea 10 months after starting date. The two million dollar giant becomes another marker in Alexander's leadership in offshore design and construction. American Tidelands 101 displaces over 4,000 tons, is 200′ x 74′ x 92′ (from hull to helicopter deck), is capable of drilling in waters up to 45 feet deep and accomodates 40 men in modern air conditioned quarters.

"Good hunting" American Tidelands 101!

ALEXANDER *Shipyard* INC.

P.O. Box 8126, New Orleans, La. • Valley 2408

PIONEERS IN OFFSHORE DESIGN AND CONSTRUCTION

AVAILABLE JOHNSTON by AL CAPP

THET'S ACCURATE SHOOTIN'!!
ONLY ONE GUY IN THESE PARTS, MO' ACCURATE THAN ME!!
THAT'S ME— ACCURATE JOHNSTON!!
AN' NOBODY'S MORE AVAILABLE THAN ME— AVAILABLE JOHNSTON!!
AVAILABLE FO' WHUT?— COURTIN'?
NO MA'M—FO' T'ESTIN' OIL WELLS, WITH MINNYMUM DOWN TIME!!
WE IS ALLUS FAST, AS WELL AS ACCURATE!!
Al Capp

C 5412

Copr. Capp Enterprises 1954

JOHNSTON TESTERS

first in drill stem testing

HOUSTON, TEXAS

LOS ANGELES CALIF • CALGARY CAN

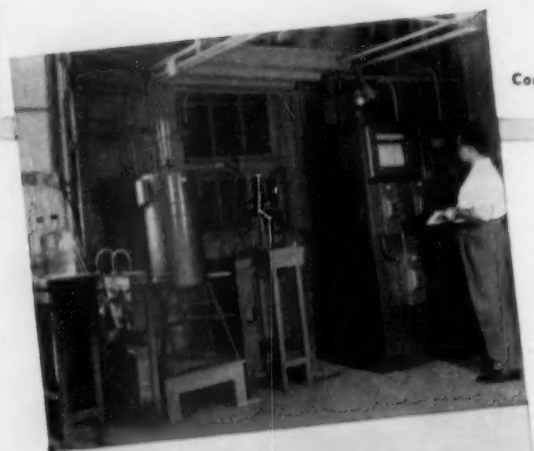
FORMATION AND CASING TESTING — JOHNSTON

If you use . . . or plan to use

HIGH-ALUMINA CRACKING CATALYST

Specify

Nalcat HA-1 or HA-2



Continuous quality control and research progress are the products of Nalco Catalyst Division Laboratories.

● If you are exploring the possibilities of high-alumina catalyst for your cracking operations, check on Nalcat HA-1 and HA-2 for research and production use. These high-alumina formulas are available in whatever quantities you require, promptly . . . as a part of the Nalco policy of *Service* to the Petroleum Industry.

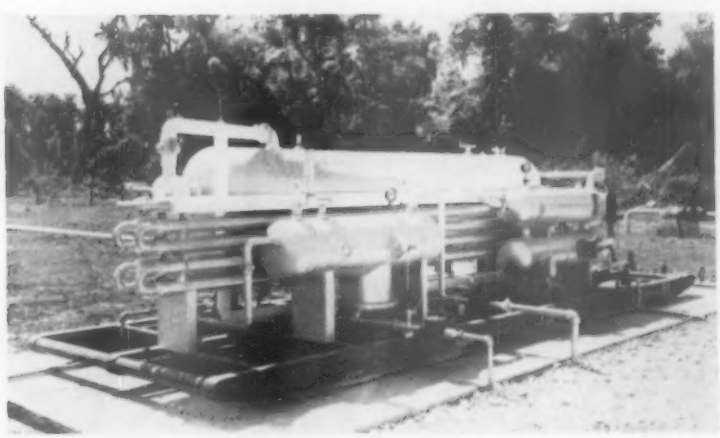
CATALYST DIVISION
NATIONAL ALUMINATE CORPORATION
4005 West 71st Street, Chicago 29, Illinois

Have You a High Pressure Gas Well?

M-C Dricold Can Help You....

WRING THE DISTILLATE OUT and **DRY THE WATER OUT**

Up to 30% Higher Distillate Recovery with a Maloney-Crawford PACKAGED COLD SEPARATOR



The Maloney-Crawford "Dricold" unit is a carefully engineered and precisely built skid-mounted cold separator. Distillate recovery from high pressure gas wells can often be increased as much as 30 percent over conventional two stage separation by producing through the Dricold Unit.

Very low water dew points are obtained through the unit, even when the available pressure drop is so low as to be considered marginal for other cold separators.

The finest available controls and accessory equipment are standard on the Dricold unit—to reduce your maintenance costs and down-time. Units are available in capacity ranges up to 15 million cubic feet a day.

Let a M-C representative show you how Dricold can meet your needs.

MALONEY-CRAWFORD TANK & MFG. CO.

MALONEY-CRAWFORD TANK AND MANUFACTURING CO.

FACTORY AND GENERAL OFFICE: 38 North Peoria—Box 659—Tulsa, Oklahoma.
EXPORT REPRESENTATIVE: Baird Lines—420 Lexington Avenue—New York, N. Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford Tank & Service Company, Ltd.—Edmonton.
TEXAS PANHANDLE REPRESENTATIVE: Atlas Tank Company—Pampa, Texas.

STRATOFLEX

HOSE and FITTINGS

1. Cut hose to length.

2. Screw on socket.

3. Oil inside and insert assembly tool.

4. Screw swivel nipple or male fitting into socket and remove tool.

★ Save Time . . . Cut Costs

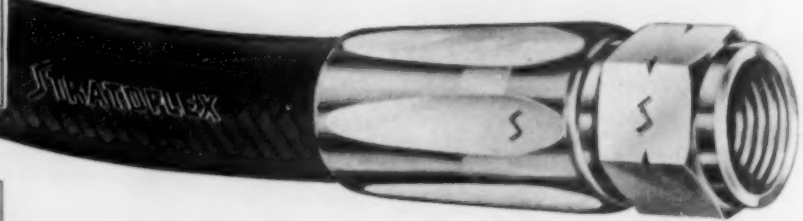
. . . in equipping new rigs or replacing worn hose assemblies. Stratoflex hose is highly resistant to abrasion and corrosion. Fittings are detachable and reusable — will not vibrate loose and are leak-proof. Your nearby Mid-Continent Supply Store stocks Stratoflex hose and fittings for hydraulic, pneumatic, fuel and oil lines.

★ Complete Hose Assemblies

. . . in stock in many sizes and lengths . . . or made up promptly to your specifications.

★ Bulk Hose and Re-usable Hose Fittings

. . . for making up your own hose assemblies in the field. Simple four-step assembly shown at left is quick and economical.



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MID-CONTINENT BLDG. FORT WORTH, TEXAS

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

DELTA-C&S proudly presents

THE FIRST INTER-CONTINENTAL DC-7 SERVICE

The Royal Caribe

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WORLD'S FINEST AND FASTEST AIRLINER . . . Non-Stop between

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A 365 mph luxury service, leaving Chicago 4:00 p.m. and New Orleans 8:45 p.m. CST daily. Special cuisine and beverages. *FEATURING* cabin air-conditioned by built-in, full-time mechanical refrigerating system . . . insuring a comfortably cool cabin at all times in the air and on the ground . . . available in the Caribbean *only* on Delta-C&S *Royal Caribe*.

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FOR SLIM HOLE JOBS SELECT A....

U-34

DRILLED BELOW 9,800 FEET WITH 2⅞" TUBING WITH SPECIAL TOOL JOINTS

Near Galveston, Texas, the Carnes W. Weaver Drilling Company used a UNIT U-34 to drill a slim hole over 9,800 feet. The U-34, designed to drill 4,500 feet with 4½ inch drill pipe, has proved unusually rugged and economical for the type of slim hole work undertaken by this Company.

Investigate the U-34 if you are considering slim hole work, medium depth drilling or deep well workover.

UNIT

UNIT RIG & EQUIPMENT CO.
TULSA, OKLAHOMA, U. S. A.

UNIT RIG & EQUIPMENT PRODUCTS ARE SOLD THROUGH LEADING SUPPLY COMPANIES THROUGHOUT THE U.S.A. AND CANADA

EXPORT SALES — MID-CONTINENT SUPPLY COMPANY 45 Rockefeller Plaza, New York 20, New York Cable — MIDUNITRIG

STAINLESS STEEL

...fights corrosion...solves many piping problems

● Stainless steel piping, using TUBE-TURN* Stainless Steel Welding Fittings, can provide long, safe service where corrosive gases or fluids are handled. Likewise, stainless steel systems are superior where temperature extremes are encountered, for handling dangerous materials safely, for preventing contamination.

Tube Turns offers a *complete line* of Stainless Steel Welding Fittings in three analyses: AISI Type 304, Type 347, and Type 316; and in four schedules: 5S and 10S (thin wall), and 40S and 80S (heavy wall). For the *right* stainless steel welding fittings, and for help in proper application, get in touch with your Tube Turns' Distributor. You'll find one in every principal city.

TUBE-TURN Welding Fittings and Flanges are made in U.S.A.
They meet all U.S. piping code specifications

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

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*"tt" and "TUBE-TURN" Reg. U.S. Pat. Off.

STAINLESS DATA

Scientifically DESIGNED

All steel construction with concrete deck and spring fender system designed for the berthing of sea going oil transports on either side.

Designed and built by W. Horace Williams Co. Inc., in 1948, for a major oil company.

W. HORACE WILLIAMS COMPANY

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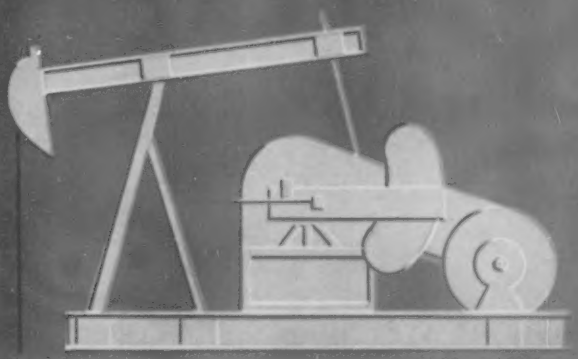
Marine Contractors Since 1908
NEW ORLEANS

OFFSHORE STRUCTURES, WHARVES, BULKHEADS, FOUNDATIONS

LEAVING MONEY IN THE GROUND?



use ATPET® 931

Oil wells which have lost production due to water blocks can be stimulated effectively by means of ATPET 931. Developed by Atlas—the world's leading producer of surface active agents—this remarkable chemical practically eliminates the force causing water in the producing sand to block oil flow, and restores production. ATPET 931, a surface tension depressant, is also valuable in well completions . . . and as an assistant in fracturing and acidizing.

It's field tested. Scores of successful treatments have been made in major producing fields. Many service companies recommend and use it because of its efficiency.

It's economical. Average treatment cost totals less than $500. Payout time is in days instead of months.

It's efficient. The percent of successful treatments is unusually high. The efficiency and low cost of ATPET 931 have made it a "best buy" for production superintendents.

Don't accept substitutes. ATPET 931 gives you field-tested performance and economy. For technical data, write or call your nearest Atlas office today, or contact your service company.

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Franklin 2-9530

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CHEMICALS DEPARTMENT
ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE
ATLAS POWDER COMPANY, CANADA, LTD.
BRANTFORD, CANADA

New Jet Gun Proves

4 Holes with WESTERN TUBULAR ROCKET JET Give You More Entry Hole Area than 11 Standard Jet Holes!

186% LARGER ENTRY HOLE

50% GREATER FORMATION AREA EXPOSED

10% DEEPER PENETRATION

Western's new ROCKET Jet Gun gives you the equivalent of a .45 Caliber hole in your casing compared with a .25 Caliber hole in your casing from the industry standard jet gun used by all other leading perforating service companies.

Therefore, 4 ROCKET Jet Gun holes will give you .56 sq. in. of entry hole area while 11 standard jet holes give only .54 sq. in. In terms of hole volume, Western Rocket fired at 4-per-foot density gives you an average of 4.20 cu. in. of hole volume per foot while 7-per-foot density with standard jet guns gives only 4.06 cu. in. of hole volume per foot.

And with Western ROCKET Jet, you get sureness and depth of penetration available only with a retrievable jet gun coupled with bullet hole size.

This greatly increased perforating performance brings you these advantages:

- **Faster cleanup . . . mud forced into hole is more easily removed.**
- **Easier entry into formation for high viscosity sand laden treating fluids.**
- **Easier entry into formation during high injection rate treatments, both acidizing and fracturing.**
- **Increased permeability with the ROCKET . . . easier access to the bore for formation oil.**
- **Full assurance of penetration had only with retrievable guns.**
- **Complete casing protection provided by the tubular gun.**
- **Premium perforating at no increase in cost.**

Ask your nearest Western Representative to show you complete data on Western's ROCKET Jet Gun performance. Let him show you how you can get up to 3 TIMES BETTER perforating at no extra cost!

Get the full details about Western's new Tubular Rocket Jet Gun *today!*

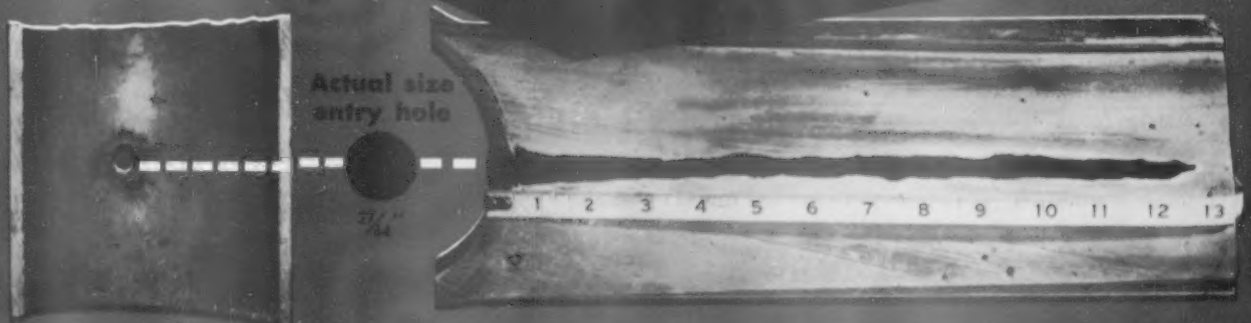
WESTERN *Engineered* WELL SERVICES

THE

*Patent Pending

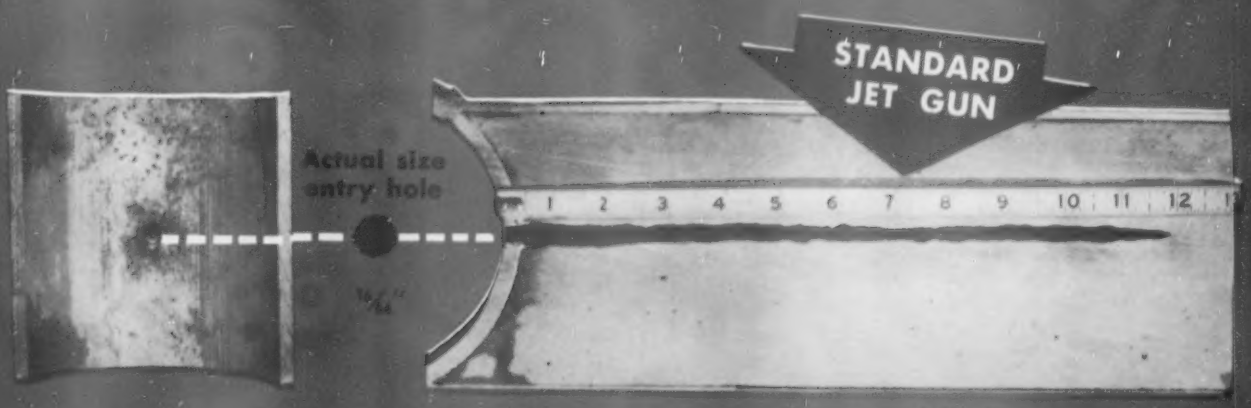
3 Times More Effective

WESTERN ROCKET* JET GUN



186% more entry hole area

Actual photographs of targets showing ROCKET Jet Gun's 186% greater entry hole, 50% greater formation area exposed, 10% deeper penetration compared with performance of industry standard jet gun. Targets: N80 5½" 20-lb. steel casing, 72-hour neat cement.



Engineered Well Services

ACIDIZING
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WESTERN COMPANY

GENERAL OFFICES:
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TEXAS: Ballinger, Borger, Levelland, Odessa, Seagraves, Snyder,

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AIR
TO
SPARE

...that's the secret of

CLARK TURBO-*SUPER*CHARGING

Obviously, any turbocharged 2-cycle engine must be supercharged. The extent to which it is supercharged is dependent on the volume of air and the pressure level maintained.

There's air to spare in Clark Turbocharged Compressors, even though a supercharging pressure of 6 psig is maintained at rated load and increased to 10 psig at maximum load.

Elevated pressures alone are not enough. While high pressure is desirable to increase power output, it must be accompanied by a sufficient volume of air: (1) To insure thorough scavenging with a cool, pure air charge for efficient combustion; (2) To thoroughly cool the power cylinder walls for proper lubrication of pistons, rings and cylinder walls.

Conversely, lower pressure supercharging reduces potential power output or results in "highly optimistic" ratings.

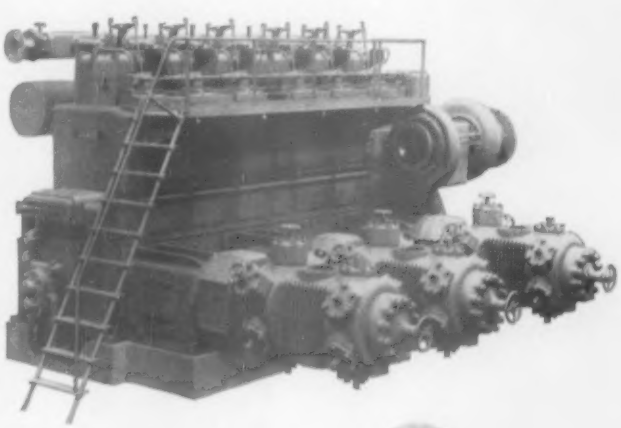
The only practical way to turbo-supercharge, therefore, is to provide a substantial volume of air at elevated pressures and to maintain the volume in proportion to the load placed on the engine. *That's precisely what Clark Turbo-Supercharging does!* The unusually high efficiency of the Clark Turbocharger permits pumping air at sufficient pressure and volume so that power output per cylinder can be increased from 33 to 65% over comparable non-turbocharged units, while cylinder wall temperatures are actually reduced.

Economical to install and operate, Clark Turbocharged Compressors are built in 8 sizes covering an 1100 to 3300 BHP range. Your nearest Clark representative has complete details. Write for Bulletin 134.

CLARK BROS. CO. • OLEAN, N. Y.
ONE OF THE DRESSER INDUSTRIES
Sales offices in Principal Cities throughout the World

CLARK

COMPRESSORS



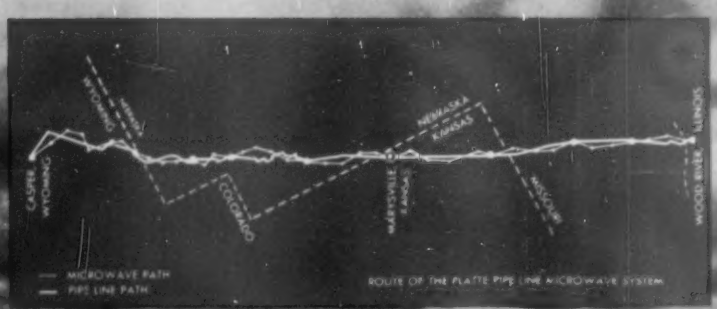
Clark sets the pace in compressor progress

75 YEARS

PHILCO MICROWAVE..

HOW PHILCO MICROWAVE IS HELPING PLATTE:

- **Operating efficiency increased.**
- **Operating costs reduced.**
- **Provides these communications facilities:**
  4 separate telephone circuits for business, dispatch, confidential and stockholder use.
- **Provides these control functions from Kansas City Control Center:**
  Reading of tank levels, pressure, flow of oil.
  Opening and closing of line valves.
  Start and stop main line pumps.
  Station shutdown.



ROUTE OF THE PLATTE PIPE LINE MICROWAVE SYSTEM

Platte microwave repeater station at Midway, Wyoming

PHILCO Famous for QUALITY the World Over

PHILCO CORPORATION

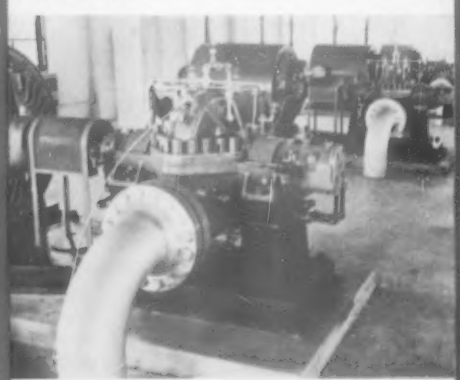
...boosts Platte Pipe Line efficiency!

The Philco microwave system of the Platte Pipe Line Company—the largest and most comprehensive installation of its kind—demonstrates the economic advantages of microwave better than any other pipe line microwave system in the nation. Here is what A. R. Heidebrecht, Chief Engineer of Platte, has to say about the system: "Our decision to use microwave was greatly influenced by the number of pipe line control functions which could be accomplished remotely and automatically. Operation to date has proved very successful; in fact, during the short time this system has been in use, the efficiency of our pipe line operation has been substantially increased."

Perhaps microwave can lower operating costs and boost the efficiency of your plant. Philco maintains a staff of experienced field and system engineers who can help plan and install your microwave system. Get information on the many leading Philco microwave installations in use today. Write to Philco, Dept. OG.

Platte Pipe Line control center at Kansas City.

Microwave operates valves along the pipe line.



Pipe line pump station operated by microwave.

PHILCO—*WORLD'S LEADING MANUFACTURER OF MICROWAVE*

GOVERNMENT AND INDUSTRIAL DIVISION • PHILADELPHIA 44, PENNSYLVANIA

In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

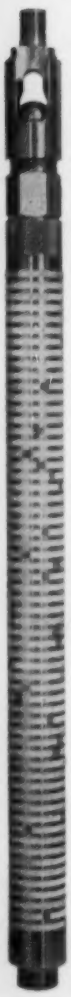
MARTIN PLUNGERS

You have a well with a high water content. Pumping that well is a worrisome, expensive headache. Those plungers you've been using just will not hold up. Expensive pulling jobs and repairs eat into your profits. Finally you start looking for an answer to the problem. And you find it . . .

You discover Martin Plungers

Why do Martin Plungers work so successfully in high water content wells when other plungers fail? . . . The answer is as simple as a skidding tire.

Water is a lubricant for rubber. And, since the Martin Plunger uses numerous split rubber and duck rings, the water content of the well actually serves as an efficient lubricant for the Martin Plunger. Where other plungers fail, the Martin Plunger goes on producing month after month.



The moment you start using Martin Plungers, your operating expense begins to drop. Pulling the pump for repairs becomes an exception rather than the rule. And, should it become necessary to repair your Martin Plunger, it may be repaired for ⅓ to ¼ the cost of a new plunger. Only the special split rubber and duck rings are replaced.

Your Martin Plunger also increases working barrel life—you will save up to 80% on barrel or tube cost due to the slow rate of wear. Yes, you discover Martin Plungers, and you discover real dependability and economy. See it at your supply store today.

JOHN N. MARTIN
Manufacturer
9 W. BRADY STREET • TULSA, OKLA.

When PRICE FIXING grabs one Industry... How long can others hold out?

PRECEDENT is being set for government price control of an industry. If price fixing by FPC could be accepted as applying to natural gas only, the decision of the Supreme Court in the Phillips case would be a matter of less national and individual concern. The threat in this throttling decision to other industry, and the sovereignty of States appalls most students of the Constitutional guarantees of free enterprise.

The Natural Gas Act of 1938 has this wording in its jurisdictional section:

"The provisions of this Act . . . shall not apply . . . to the production or gathering of natural gas."

In eleven instances the Federal Power Commission itself accepted this interpretation by ruling it had no authority to fix the price of gas in the field. One such decision in 1951 was carried into the courts as the Phillips case; and in June, 1954, the Supreme Court ruled that under other wording of the Statute, the Federal Power Commission can regulate or fix the price of gas sold by a producer to a natural gas (pipeline) company in an interstate sale.

The implications of this decision were summed up by Governor Allen Shivers of Texas before the Interstate Oil Compact Commission in Chicago, like this:

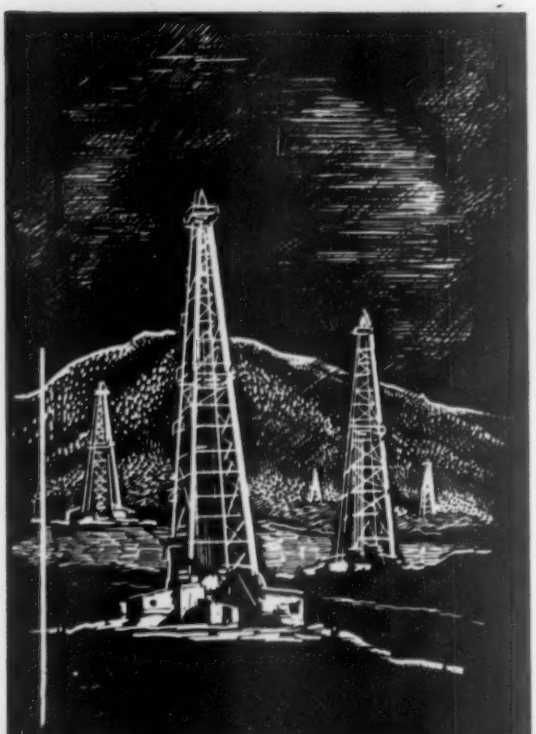
"The Supreme Court's rule, in the Phillips decision, overturns all the precedents of our national experience by removing from the States the right to exercise the police powers reserved to them by the Tenth Amendment as a part of the Sovereign Bill of Rights.

"This is a drastic change, an unwanted and an unwarranted change, a change which I do not believe the people of the United States are willing to accept . . . If the power of the federal government can reach to the well heads of oil and gas fields in Texas and Oklahoma . . . it can likewise reach to the crop rows of Iowa, the dairy sheds of Minnesota, the mine faces of Illinois and wholly change the character of private enterprise as well as the character of the government of this land of ours."

HOUSTON CONTRACTING COMPANY
General Contractors

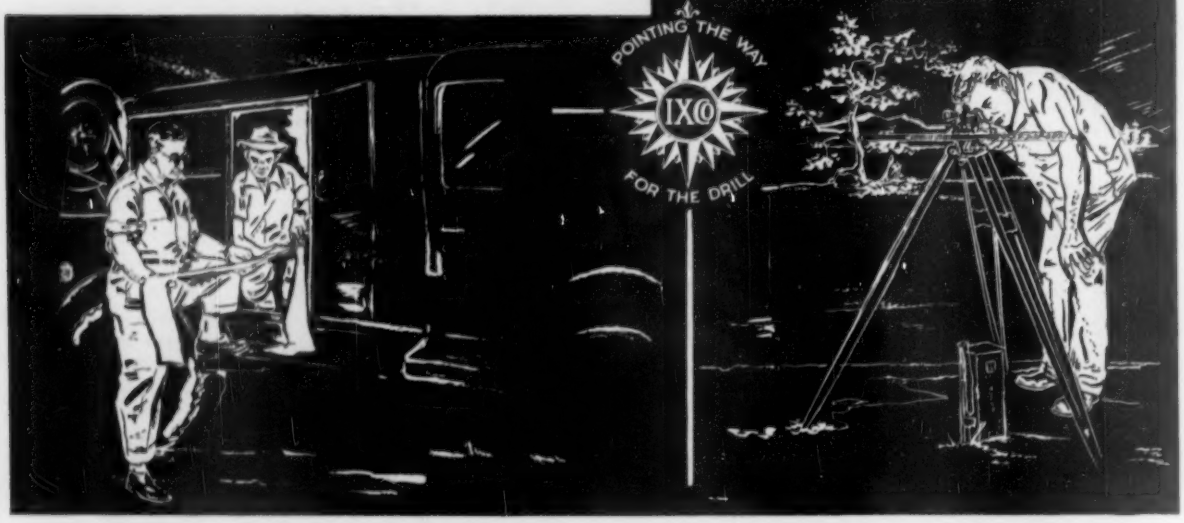
Laurence H. Favrot • R. P. Gregory • Geo. A. Peterkin
OIL • GAS • GASOLINE • WATER PIPE LINES • 2707 FERNDALE, HOUSTON 6, TEXAS

It's a long, long way from the bottom of a surveying party to the top man position. However, B. B. Robinson, Jr., like so many other IX personnel, started as a surveyor with a party over 20 years ago . . . worked up through the jobs of observer, computer, and party chief to his present position of supervisor and manager of IX's Fort Worth office.



DERRICKS TODAY

Where I.X. Parties Were Yesterday



No seismographic survey party picks up its know-how overnight – it takes years of intensive field work . . . years of working together . . . before a party can be depended on to turn in a fast and accurate survey. That's where Independent Exploration parties come out on top – they're staffed with the know-how that comes from experience. These parties know the shortcuts that save time and money without sacrificing accuracy – employ these shortcuts to *your* advantage. Enlist this invaluable extra on your *next* survey – call on IX for a better job.

Independent

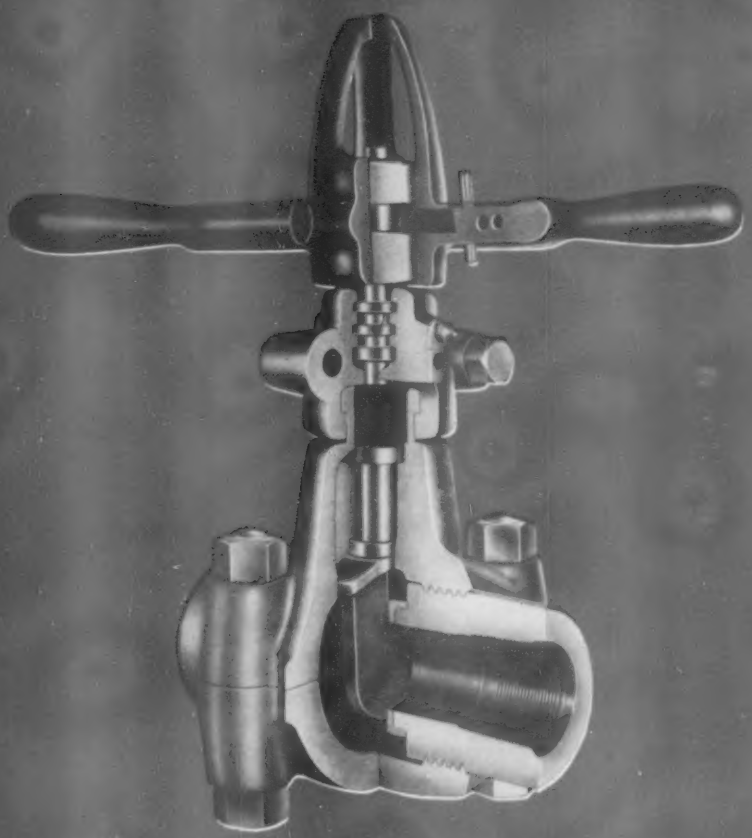
EXPLORATION COMPANY

Geophysical Surveys

1973 West Gray, Houston, Texas

19 Victoria St., London, SW 1, England

208 Dominion Bank Bldg., 8th Ave. & 1st St. East, Calgary, Alberta, Canada

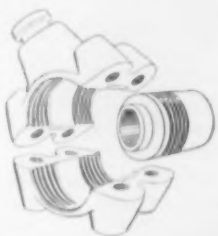


Cameron

FLEX-SEAL VALVES SAVE TIME AND MONEY WITH THESE EXCLUSIVE FLEX-SEAL FEATURES...

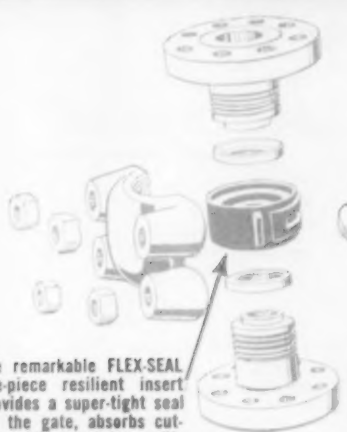
Faster rigging up . . . faster rigging down . . . easy, inexpensive repairs up the rig with ordinary rig tools . . . low-cost replacement parts, even to the two-piece body . . . these are some of the Flex-Seal features that have made a host of friends for Cameron among drillers and rig owners throughout the oil world. Add to this the fact that Flex-Seals operate easily and seal tightly . . . even after long service . . . and you have the reason for the outstanding success of this fine valve.

FLEX-SEAL is the only mud valve that serves as a union. The hubs are attached to the body by interlocking shoulders and grooves. This exclusive feature permits swiveling, saves rigging-up time and the cost of line unions.

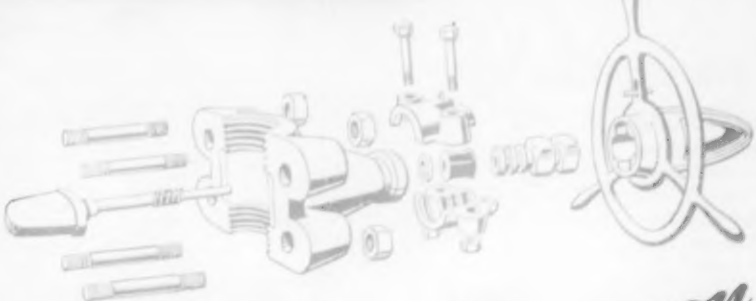


FLEX-SEAL design assures low-cost maintenance. The body, for example, is in two pieces with the hubs separate. Should the valve become sand cut, it can be restored to its original condition by replacing an inexpensive part . . . not an entire body. The design is so simple that any member of the drilling crew can overhaul it completely with regular rig tools.

This shoulder on the Flex-Seal gate contacts the top of the gate packer when in the closed position, thus preventing "flowing" of the resilient packer and prolonging its life.



The remarkable FLEX-SEAL one-piece resilient insert provides a super-tight seal for the gate, absorbs cutting action and is readily replaceable.



FLEX-SEAL Valves have a lot of parts and there's a good reason for it. Each individual part is replaceable at a minimum of expense. The replacement of small, inexpensive parts and the elimination of costly delays, transportation, and valve repair shop charges, has found favor with cost-conscious operators the world over.

Cameron

IRON WORKS, INC.

P. O. Box 1212, Houston, Texas

Export Office: 7912 Empire State Bldg., New York City. In England: British Oilfield Equipment Co., Ltd., Time & Life Bldg., New Bond Street, London W. 1 England.

What is there you want to know about the OIL INDUSTRY?

UNITED STATES PETROLEUM DEVELOPMENTS

Supply and Demand
Statistical Position of Major Supply Areas
Trends and Forecasts
Inter-regional Movements
Foreign Trade
Prices
Investments, Expenditures
Oil Finding and Development Costs
Reserves
Exploration, Drilling
Production
Natural Gas
Refining and Processing
Petro-Chemicals
Natural Gasoline
Gas Cycling, Carbon Black
Marketing and Utilization
Transportation
Communications

THE WORLD'S PETROLEUM DEVELOPMENTS

International Trade
International Oil Movements
Supply and Demand
Trends and Forecasts
Capital Investments
Expenditures
Reserves
Exploration, Drilling
Production
Refining and Processing
Plants and Facilities
Marketing and Utilization
Transportation
World Prices, Exchange Rates
International Conversion Factors

THE ANSWERS ARE HERE →→

FOREIGN PETROLEUM DEVELOPMENT

Supply and Demand
Statistical Position of Major Supply Areas
Trends and Forecasts
Investments and Expenditures
Ownership of Foreign Petroleum Industry
Reserves
Production
Refining and Processing Facilities
Marketing and Utilization
Prices
Transportation
Communications
Foreign Petroleum Laws

MAPS... GRAPHS... CHARTS...

which interpret every significant facet of oil operation

EMPLOYMENT AND WAGES

Review of Labor Developments
Employment and Payrolls
Domestic and Foreign Wage Scales
Wages and Living Costs
Compensation Insurance Rates
Injury and Accident Statistics
Foreign and Domestic Labor Laws

TAXES, DOMESTIC AND FOREIGN

Review of Developments
Digest of Tax Laws
Federal Income and Excise Taxes
Depletion Versus Expenditures
Production Taxes
Ad Valorem Taxes
Sales Taxes

INVESTMENT AND FINANCE

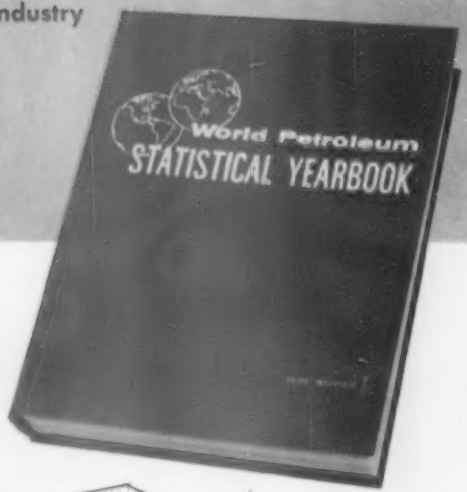
Financial Position of Petroleum Industry
Capital Employed Income, Expenditures, Profits
Position of Leading Companies
Operating and Financial Data of Companies
Subsidiaries of Integrated Oil Companies

All the answers are HERE

In this one-volume encyclopedia of the world-wide oil industry

World Petroleum STATISTICAL YEARBOOK

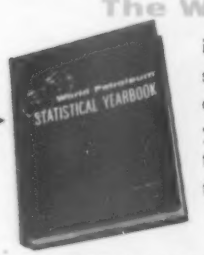
FIRST EDITION



Edited and Compiled by Henry J. Struth

Here, for the first time, is one authoritative source book—of more than 400 pages—with statistical information and interpretive graphs, maps and charts to answer **all** your oil industry questions. Up-to-date facts and figures on **production . . . refining . . . marketing . . . taxation . . . foreign operation . . . transportation . . .** are just a few of the subjects covered! This one-volume library brings you the most dependable information on **all** branches of the petroleum industry—**FOR EVERY STATE IN THE UNITED STATES . . .** and **every country in the world!**

The World Petroleum Statistical Yearbook



interprets and places the results of more than 25,000 man-hours of research at the disposal of busy executives, department heads, operating engineers and all men concerned with this world-wide industry. It puts at your fingertips the kind of reports and surveys that major companies in the petroleum industry spend thousands of dollars and months of research to obtain.

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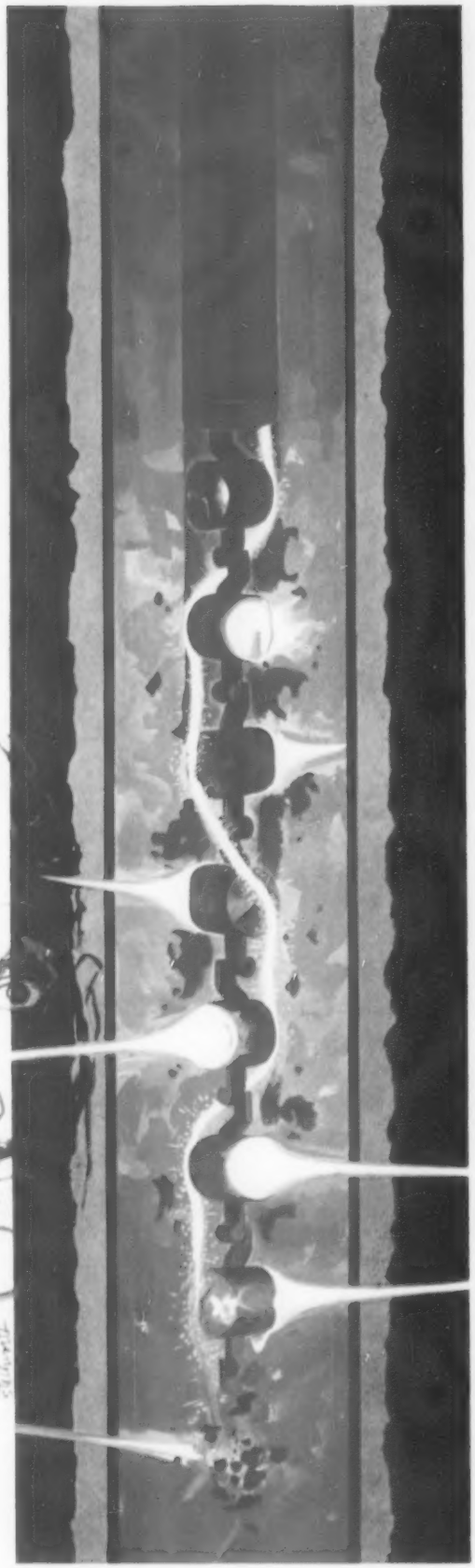

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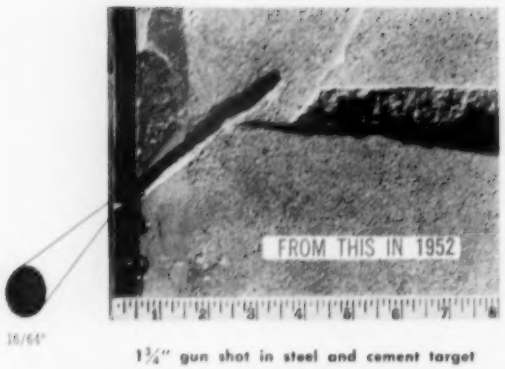
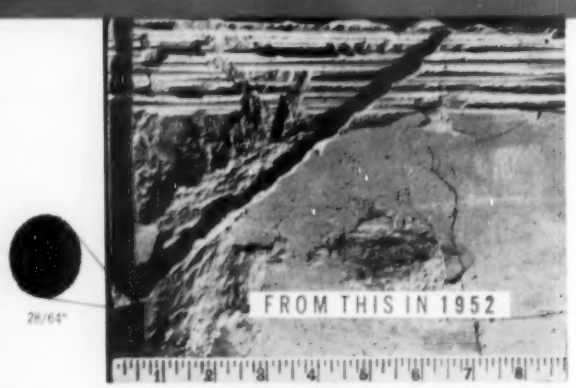


1¾" gun shot in steel and cement target



2⅜" gun shot in steel and cement target

These targets are graphic proof of Schlumberger's leadership in the perforating field.

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MORE THAN 300 LEADING MANUFACTURERS

are already putting

SKF TYPE "C" BEARINGS

in their products

Here are the trade marks of a few of more than 300 leading manufacturers — companies who want extra bearing performance — who already are using the *improved* SKF Type "C" Spherical Roller Bearing announced less than a year ago.

There are two reasons why

First: They know that for over 40 years, SKF has been *first* with anti-friction developments that *work*.

Second: They obtain, size for size, up to 50% more capacity, 2 to 3½ times increased life with SKF's Type "C" Spherical than they can obtain with any other available design, and at no increase in cost.

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— manufacturers of **SKF** *and* HESS-BRIGHT® *bearings.*

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SKF®

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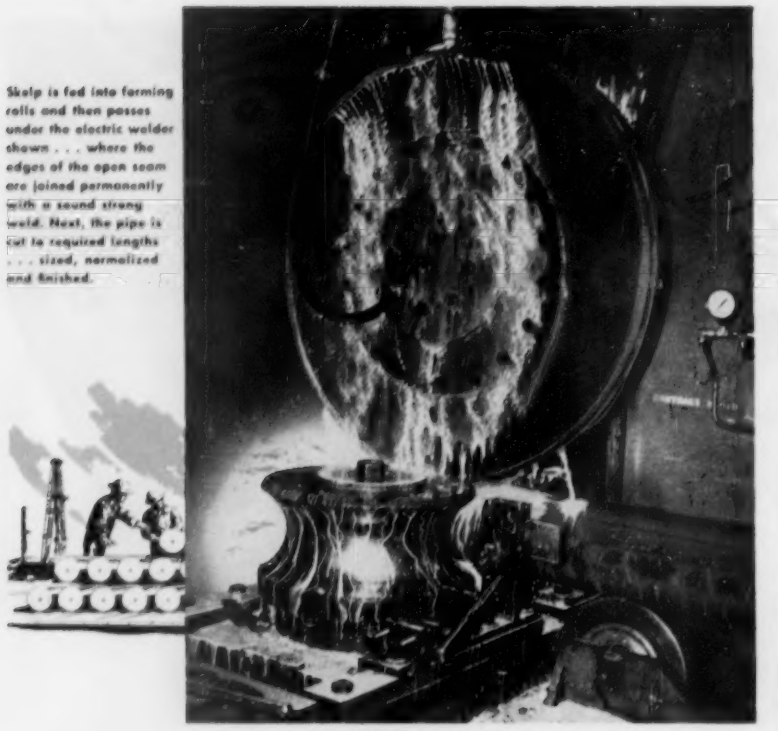
Skelp is fed into forming rolls and then passes under the electric welder shown . . . where the edges of the open seam are joined permanently with a sound strong weld. Next, the pipe is cut to required lengths . . . sized, normalized and finished.



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An ultra-modern, completely integrated steel mill... right in the heart of the fabulous Mid-Continent area... dedicated to prompt service to the petroleum industry. Lone Star's multi-million dollar electric-weld pipe mills... equipped with the newest, most efficient machinery ever designed... are turning out oil country tubular goods to the exacting specifications of the American Petroleum Institute. Lone Star is geared to *your* needs... with quick delivery a routine Lone Star service. Depend on Lone Star.

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They Say—

Straightening Party Lines

Dear Sir:

I note that your item in the March 7 issue of the Journal relating to my notification to the President and his designation of a successor upon the expiration of my term, June 22, states that I "was a Republican when (I) joined the FPC. Later (I) changed to an Independent."

It is perhaps natural that your writer should have assumed that I was appointed to the commission as a Republican since, as a non-Democratic member, I was then charged, in accordance with precedent, to the then Republican minority.

The facts are, however, as your writer could have easily verified by a call to my office or a check with the records of the Senate committee on interstate and foreign commerce, that I have been officially Independent since 1937. This has been well known in New Hampshire and Washington and the transcript of the record on my hearings before the Senate committee relating to my confirmation in 1950 (June 14) at page 5-7 covers this point specifically.

This is perhaps a small matter, but the suggestion that I had somehow or other shifted my political affiliation during my tenure on the Federal Power Commission carries some misleading, and perhaps undesirable, connotations.

Nelson Lee Smith
Washington.

You're Right, and Then Some

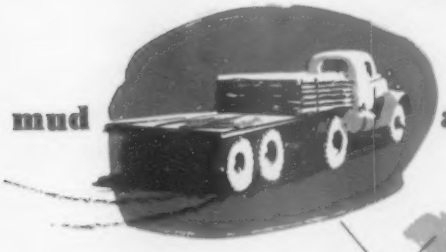
Dear Sir:

I own considerable oil royalty over acreage in four or five states. I am retired and live on the income. Years back when selling royalty interests in vacancy strips in the Yates pool, Pecos County, Texas, I was informed by a certain Texan that there was one well which came in in that field for a daily flow, flush, of 104,000 bbl. I believed him.

In an effort to interest a very dear old friend of quite some consequence in metropolitan New York, I stated that there was such a well in the Yates pool. He is a highly educated man, successful,

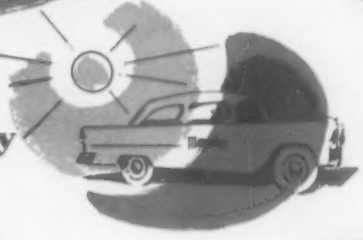
Magcobar means more than

mud



alone . . .

it means day



and night

nation-wide

mud engineering service.

It's a twenty-four hour, day and night job to give the kind of service the oil industry needs. And Magcobar mud engineers and dealers alike gladly accept this requirement for good service. Ever since Magcobar entered the drilling mud picture, field mud engineering service has been constantly improved and expanded. In fact, Magcobar alone today has more mud engineers in the field than the total of all mud companies just a decade ago. When you need service at your well, call the dealer who stocks Magcobar. You'll get the best mud service in the oil fields.

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DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION
ONE OF THE DRESSER INDUSTRIES
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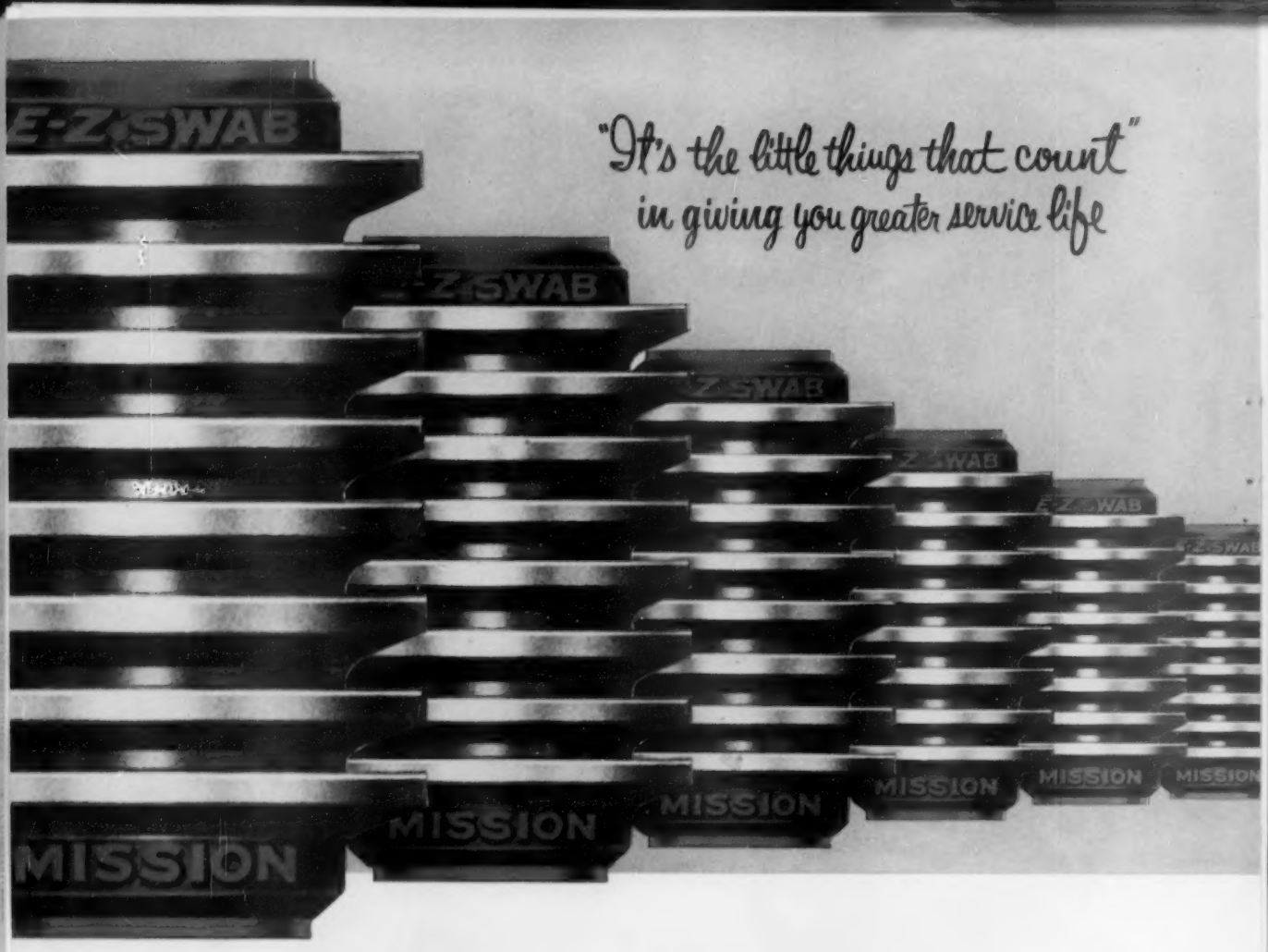

"It's the little things that count"
in giving you greater service life

Where Mission makes the difference

What has been your greatest problem in swabbing? Overloads? Stuck swab? Broken lines? Expensive tubing jobs? Well, you can positively eliminate every one of these problems with the Mission E-Z Swab, the first and only swab on the market to utilize flexible rubber fins so that the swab will pass smoothly through tight spots in pipe on both the up and down strokes. Line breakage due to overloads is also a thing of the past. Mission E-Z Swab Rubbers are designed to lift a controlled amount of fluid. If the operator tries to pull too much fluid, the fins bend down and automatically by-pass excess fluid. After the overload is by-passed, Mission E-Z Swab fins spring up until they again seal against the pipe. Add these other advantages: smaller swab inventory, controlled fluid lift, guaranteed performance. Try the Mission E-Z Swab on your next job. If it does not prove far superior to any other swab you have ever used before, the entire purchase price will be promptly refunded. So take advantage of the difference Mission has made in swab design to improve your swabbing results. Your supply store has Mission E-Z Swabs in stock.

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Your workers will say they never had comfort like they get in the new Willson Contour-Spec—and its new hinged bridge adds an extra measure of protection, too!

It's the *hinge* that permits equal pressure at every point of contact with the face . . . snug comfort regardless of facial contour! And it's the hinged bridge that means extra safety because there are no dangerous gaps around the eyes.

Contour-Specs conform to *any* face—heavy, lean, round, long or bony! Result is, a new concept of comfort combined with protection that encourages workers to wear them willingly.

Let them try Contour-Specs—see how well the 47-mm. lenses suit every eye size—feel how easily the lightweight, snug-fitting Butyrate plastic frame "sits" without pressure anywhere. Order a supply from your Willson distributor now.

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and a partner in one of the best-known public accounting firms in the U. S. His wife and mine were close friends. Ever since then, when he laughed at the absurdity of such a well, our friendship has ceased. He has always regarded it that I exaggerated deliberately.

Do you know whether there was such a well? . . .

F. R. W. Ross
Upper Montclair, N. J.

Editor's Note: Reader Ross's figure actually is rather conservative. Ohio Oil Co.'s Yates 30A was completed in 1926 for a reported potential of 8,524 bbl. per hour. On a 24-hour basis, this figures 204,576 bbl. per day.

How to Mount Weight Indicators

Dear Sir:

In your March 7 issue you showed a Martin-Decker weight indicator attached to a corner of the rig structure, and recommended such an installation for ease of moving.

We don't advise this because of the intense rig vibration to which the instrument would be subjected. The proper way, of course, is to mount the weight indicator on a 3-in. pipe post sunk in the earth under the rig or mounted on the rig substructure . . .

Franklin S. Crane
Chief Engineer
Martin-Decker Corp.
Long Beach.

Likes Our Time Savers

Dear Sir:

I would like to compliment you on the excellent method of presentation you are now using in The Oil and Gas Journal. It certainly is a time-saver for those of us who like to have broad coverage in our reading. The Page 1 summary and the technology-operation summary are extremely helpful.

C. G. Kirkbride
President
Houdry Process Corp.
Philadelphia.

Unorthodox Geology?

"There still appears to be about as many possible future oil and gas provinces in sight (in the United States and Canada) as there ever were.

"I, for one, see no lack of future supply in North America if we maintain the incentive to explore. . .

"Scientists can only predict from what evidence they can see and measure, and current discoveries have always exhausted all of the possible orthodox predictions . . . Probably no geologist

IDECO'S 400-ton "Big Shorty" block takes fleet angles in stride with TIMKEN® bearings

HERE'S how engineers at IDECO, one of the Dresser Industries, solved the thrust problem set up by fleet angles on the lines of this "Big Shorty" block. They mounted the sheaves on Timken® tapered roller bearings. Timken bearings are *tapered* to take the heavy thrust loads, as well as radial loads, in any combination. They keep the sheaves in positive alignment regardless of fleet angle or line load, give the 400-ton capacity "Big Shorty" block maximum stability.

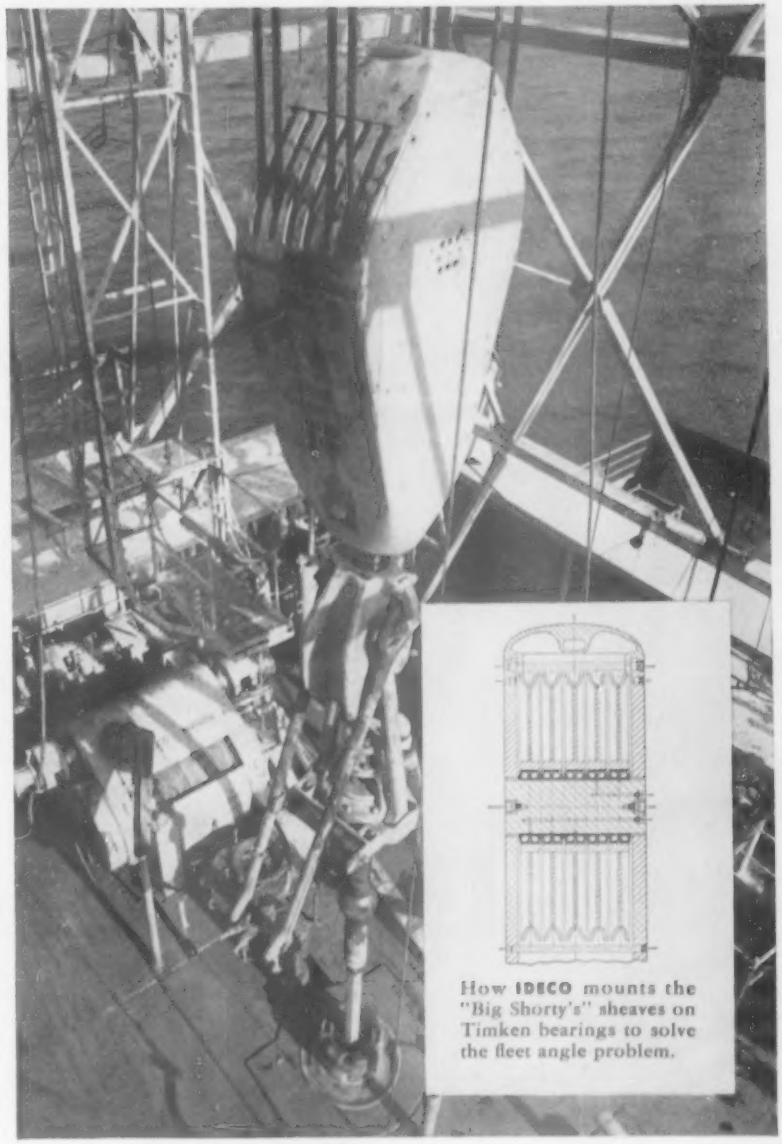
Timken bearings are designed to roll true and they're precision-made to live up to their design. As a result, the sheaves rotate freely and easily, even with a full weight of drill string, reducing line slippage and wear. And Timken bearings take heavy loads because they have full line contact between rollers and races. The rollers and races have shock-resistant cores under hard, wear-resistant surfaces.

Timken bearings cut lubrication expense, too. They keep the block's sheaves concentric with its center pin, making closures more effective. This keeps lubricant in, keeps dirt and moisture out.

Ideco equips its entire line of traveling and matching crown blocks with Timken bearings. The line includes 100-ton, 160-ton, and 260-ton traveling blocks as well as the 400-ton "Big Shorty" block.

When you buy or build machinery, be sure you get the best. Always look for the trade-mark "Timken" stamped on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **IDECO** mounts the "Big Shorty's" sheaves on Timken bearings to solve the fleet angle problem.

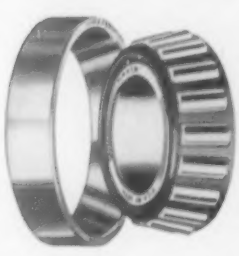
DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

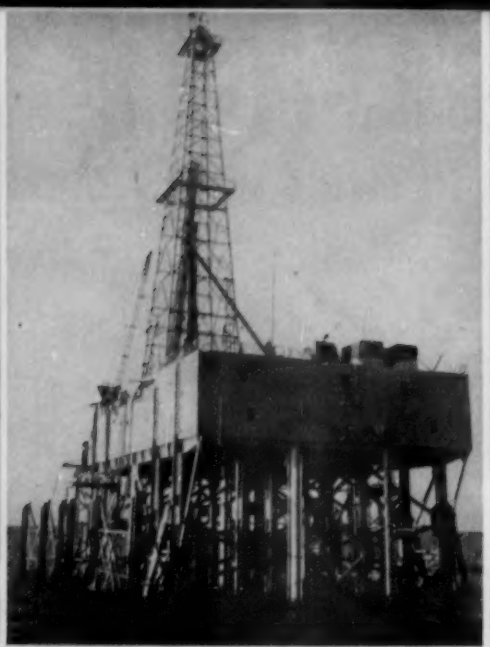
The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

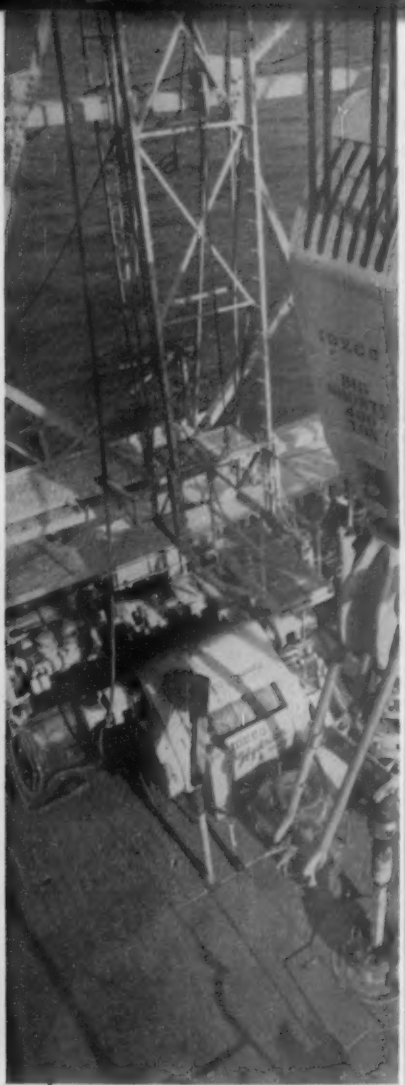
TIMKEN

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⊂ THE TIMKEN TAPERED ROLLER ⊃ BEARING TAKES RADIAL ◐ AND THRUST ⊣◐⊢ LOADS OR ANY COMBINATION





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IDECO, Dallas, Tex.—Hydrair and Power Rigs; Full-View Masts; Substructures; Single, Dual and Drive-In Rambler Rigs; Blocks, Swivels, Rotaries; Mud-Pumps; Petroleum Equipment and Supplies.

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PACIFIC PUMPS, INC., Huntington Park, Calif. — Centrifugal pumps for refineries, power stations, pipelines, and chemical plants; plunger pumps for oilwells.

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Pioneer in developing dependable rotary drilling rigs, Ideco is guided by your needs in building the industry's "most-wanted" drilling equipment. Ideco products include Hydrair rigs, power rigs, Single and Dual Rambler rigs, Drive-In Ramblers, Full-View masts, Kwik-Lift masts, Kwik-Lever-Lift masts, Full-Lever-Lift masts, Shorty blocks, Streamlined Swivels, Rotaries, Mud-Master and Flo-Master slush pumps, Air-Tite clutches, accessories and supplies. Since the founding of its Beaumont, Texas, plant in 1920, Ideco has set the pace in the drilling equipment industry. For more hole per dollar, drive *your* drill string with Ideco drilling equipment.

How the DRESSER *plus* works...

The Dresser *Plus* goes to sea! Ideco drilling equipment and Magcobar drilling muds form a seaworthy duet on Kerr-McGee's big barge No. 44 off the coast of Louisiana. Ideco equipment on this seagoing rig includes Airflo 1350-S rig, Hydrair H-35-S rig, 400-ton Big Shorty block, 300-ton Streamlined swivel, Streamlined oil-bath rotary, two Clark-Ideco T-880 slush pumps, and driller's console. Also on "sea duty" on the Kermac rig are Magcobar specialized drilling muds, best suited for offshore drilling.

The Dresser *Plus* is the *extra* plus value you get when you are served by any one of Dresser Industries. Operating independently to assure maximum attention to your specific needs, these Dresser companies work together to provide a versatile group of research, engineering and manufacturing services. On land or sea . . . Dresser equipment and services are the standard of comparison the world over!

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DRESSER MANUFACTURING DIVISION

DRESSER MANUFACTURING DIVISION, Bradford, Pa. — Couplings for joining pipe, pipe repair clamps and sleeves, welding fittings, flanges, rings, weldments, forgings.

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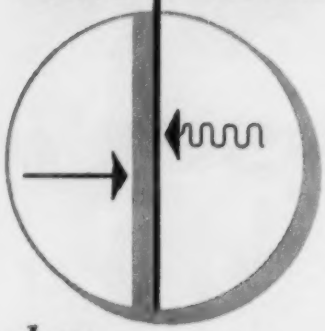
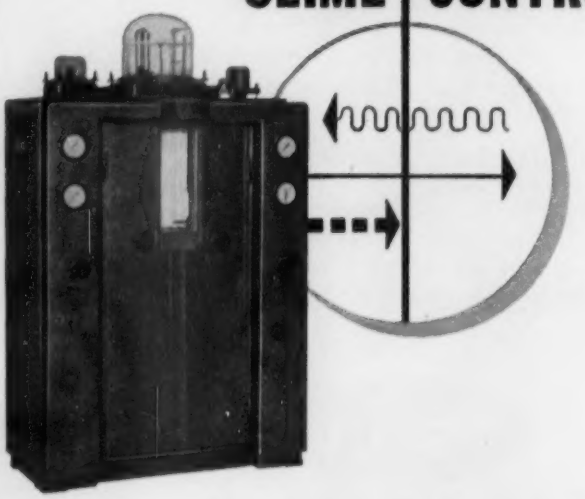


Be sure you have

SLIME | CONTROL



Whether you heat or cool water for make-up, process or any other use, you will need Wallace & Tiernan Chlorination to help combat slime problems introduced by water-borne bacteria or air-borne bacteria.

With slime control equipment designed for any need, built for lasting and dependable service, highly accurate and backed by over 40 years of successful application experience, Wallace & Tiernan Chlorination can help you increase the efficiency of your plant and cut operating costs. For further information write our Industrial Division.

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CD-39

was so unorthodox as to predict East Texas, West Texas, Alberta, and many other provinces.

"When we stop to think about future petroleum provinces, we are really stepping out into an unknown area where the light is very dim. The evidence that can be used is at best fragmentary, and an opinion that some barren region will eventually produce oil and gas is generally made when every trap located by orthodox means has been drilled, and every known theory has been tested.

"Such an opinion is bound to be unorthodox and can only be made if it is based on some hitherto unknown or unused evidence . . .

"Is it not reasonable, then, to expect that every large unexplored or partially explored sedimentary region contains unknown factors that may be favorable to oil and gas accumulation?"

A. I. Levorsen, Tulsa consulting geologist, in an address before the New Orleans meeting of the Southwest District of the Division of Production of the American Petroleum Institute.

Refining Tax Scorched

"A bill that would strike a deadly blow to the Texas oil-refining industry, which is concentrated in the Houston coastal area, was introduced in the legislature . . . It would levy a 'processing' tax of one cent per gallon on the making of gasoline and other combustible condensates.

"This tax exceeds the profit now made by refiners. Thus, in order to stay in business, they would have to pass it either backward to the oil and gas producers, or forward to retail gasoline consumers. It could not be passed to out-of-state consumers . . .

"Such a punitive tax would reverse a policy which has encouraged the development of some of the world's greatest industries in our state. It would raise a threat to manufacturing of all kinds. It is unthinkable that the Texas Legislature would approve such a blighting measure. Everyone interested in the continued industrial and commercial progress of Texas should join in opposition to it."

Editorial in the Houston Post.

Texans Would Suffer

Dear Sir:

The bill introduced by Rep. Jerry Sadler in the Texas Legislature *(The Oil and Gas Journal, February 28, page 89)* will not stand the test of practicality. Unless every state producing combustible condensates adds a tax equal

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to the 1 cent posed by Mr. Sadler, Texas producers and refiners would be penalized by the amount of the tax.

Huey Long once tried this tactic. He passed a law, but had sense enough not to levy the tax. Legislators who do not understand first principles in economics should not tamper with the welfare of the state. In the end it is not the oil industry that pays the tax, but people. If you impair the industry in Texas by making it cheaper to refine oil elsewhere, Texas people deriving benefits from taxes will suffer.

Emby Kaye
Tulsa.

CALENDAR OF EVENTS

MARCH

28-30 Western Petroleum Refiners Association, 43rd annual meeting, Plaza Hotel, San Antonio.

28-31 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Exploration Paleontologists and Mineralogists, annual meeting, Hotel Statler, New York.

28-April 1 American Society for Metals, 9th western exposition and congress, Pan American Auditorium, Los Angeles.

30-April 1 17th annual American Power Conference, sponsored by Illinois Institute of Technology, Sherman Hotel, Chicago.

APRIL

4-5 Wilcox Trend Symposium, Eighth Oil Recovery Conference, Texas Petroleum Research Committee, Texas A. & M. College, College Station, Tex.

5-7 Corrosion control short course, sponsored by University of Oklahoma and Central Oklahoma Section of National Association of Corrosion Engineers, University of Oklahoma Extension Study Center, Norman, Okla.

13-15 Rocky Mountain District, American Petroleum Institute, Division of Production, Gladstone Hotel, Casper, Wyo.

13-15 Natural Gasoline Association of America, annual convention, Baker and Adolphus hotels, Dallas.

13-15 American Society of Lubrication Engineers, tenth annual meeting, Hotel Sherman, Chicago.

13-15 National Petroleum Association, 52nd semiannual meeting, Cleveland Hotel, Cleveland.

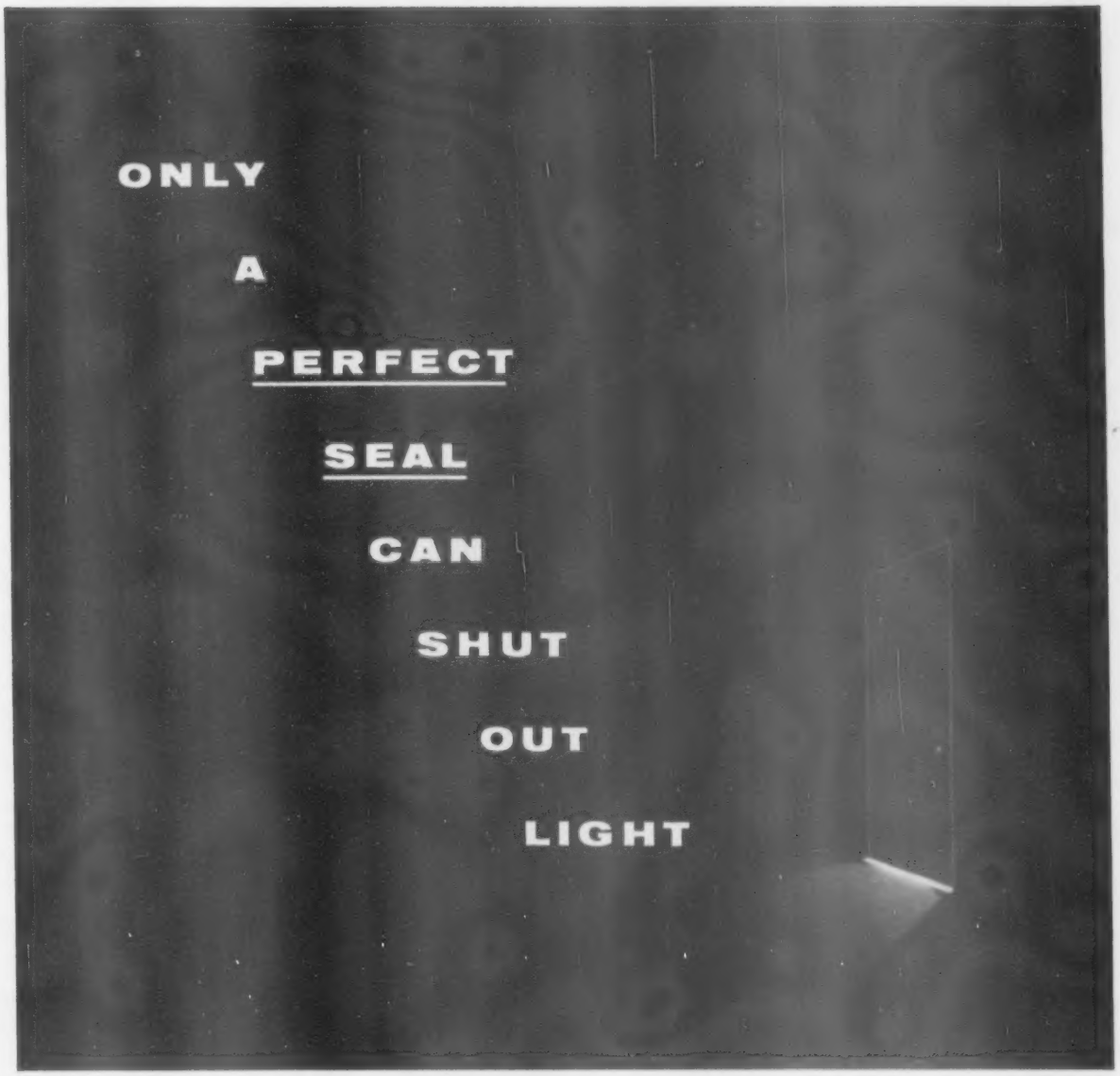
14 Independent Oil Producers and Land Owners Association, Tri-State (Illinois, Indiana, and Kentucky) annual meeting, McCurdy Hotel, Evansville, Ind.

18 Illinois Oil and Gas Association, 10th annual meeting, Mt. Vernon, Ill.

18-20 American Society of Mechanical Engineers, spring meeting, Lord Baltimore Hotel, Baltimore.

19-20 Pacific Coast Gas Association, distribution conference, Phoenix.

19-21 Oil Heat Institute of America, annual meeting, Conrad Hilton Hotel, Chicago.



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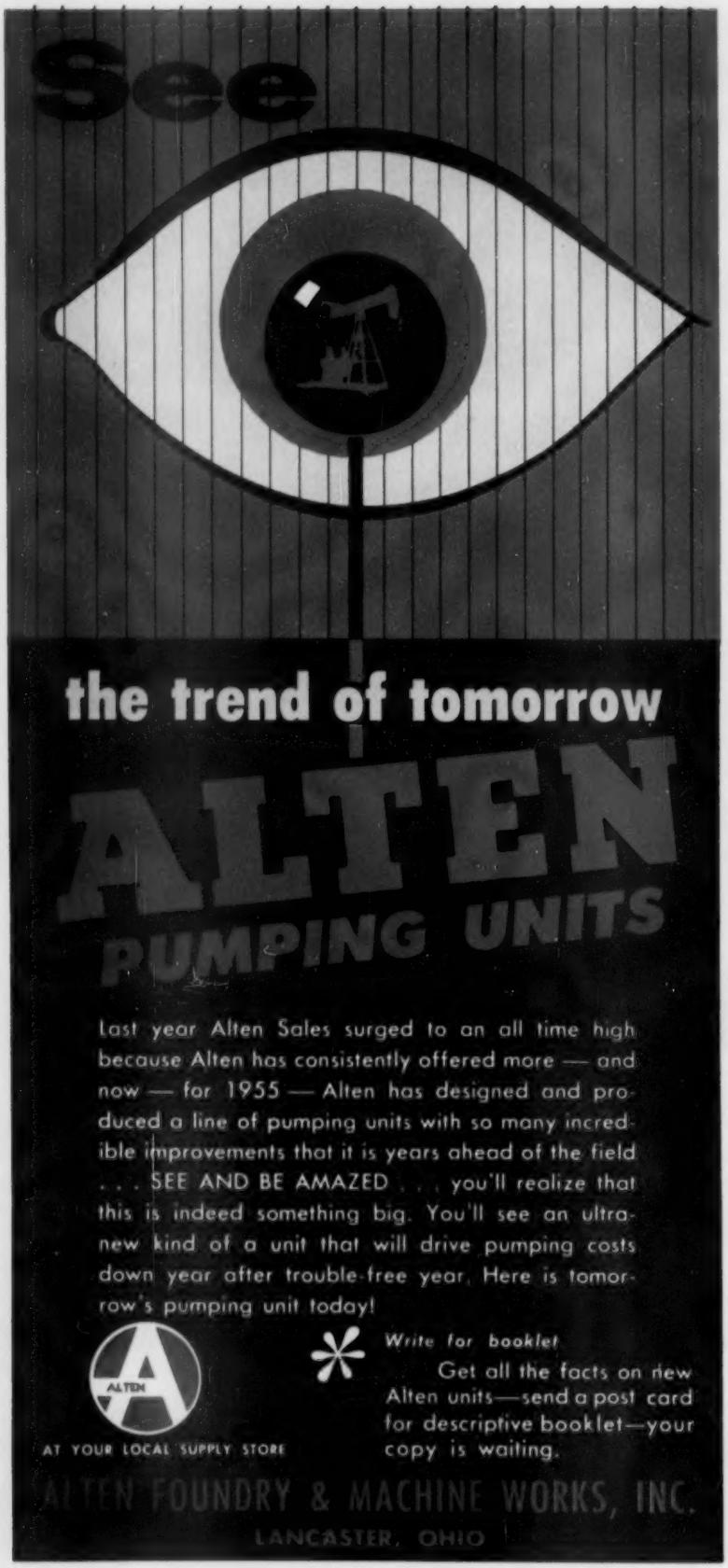
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19-21	Southwestern Gas Measurement Short Course, North Campus, University of Oklahoma, Norman, Okla.
19-22	Vancouver Section, National Association of Corrosion Engineers, corrosion short course, University of British Columbia campus, Vancouver.
20	American Society for Testing Materials —DCC, Kansas regional group meeting, Broadview Hotel, Wichita, Kans.
20-22	Petroleum Industry Electrical Association, annual conference, Shamrock Hotel, Houston.
24-27	American Society of Mechanical Engineers, Region VIII engineering conference, Rice Hotel, Houston.
25-26	Independent Petroleum Association of America, midyear meeting, San Antonio.
28-29	American Petroleum Institute, Division of Production, spring meeting of Pacific Coast district, Statler Hotel, Los Angeles.
28-29	Refining Committee, Rocky Mountain Oil and Gas Association, annual meeting, Cosmopolitan Hotel, Denver.
29-30	American Association of Petroleum Landmen convention, Hilton Hotel, Fort Worth.

MAY

1-4	Liquefied Petroleum Gas Association, annual convention, Conrad Hilton Hotel, Chicago.
1-4	American Institute of Chemical Engineers, Shamrock Hotel, Houston.
2-3	Gas Compressors Institute, Legion Hall, Liberal, Kans. Sponsors: University of Kansas and Southwest Kansas Petroleum Industry.
9-10	American Gas Association, Gas Supply, Transmission and Storage Conference, Hotel William Penn, Pittsburgh.
9-11	10th Purdue Industrial Waste Conference, Memorial Union, Purdue University.
9-12	American Petroleum Institute, Division of Refining, midyear meeting, Jefferson Hotel, St. Louis.
11-12	Pacific Coast Gas Association, gas supply and transmission and conference of technical session, Palm Springs, Calif.
11-13	American Petroleum Institute, Division of Production, Eastern District spring meeting, William Penn Hotel, Pittsburgh.
12-13	Sixth Symposium, "Automation—Engineering for Tomorrow," School of Engineering, Michigan State College, East Lansing, Mich.
12-19	Sixth Latin American Congress of Chemistry, Caracas, Venezuela.
14-22	World Wide Chemical Plant and Equipment Exposition and Congress, Frankfurt, Germany.
16-18	American Petroleum Institute, Division of Transportation, products pipeline confrence, Edgewater Beach Hotel, Chicago.
16-18	Southern Gas Association, New Orleans.
19-20	Society of Exploration Geophysicists, 10th annual Gulf Coast meeting, Plaza Hotel, San Antonio.
20-22	Appalachian Geological Society, Virginia Geological Survey, and West Virginia Geological Survey, spring field conference, Kavannaugh Hotel, Harrisonburg, Va.
23-25	American Petroleum Institute, Division of Marketing, midyear meeting, Chase and Park Plaza hotels, St. Louis.
26-27	Western Petroleum Refiners Association, technical-industrial relations meeting, Settles Hotel, Big Spring, Tex.

26-27 American Institute of Mining and Metallurgical Engineers, Rocky Mountain Petroleum Sessions, Shirley-Savoy Hotel, Denver.

26-27 Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington.

30-June 1 Chemical Institute of Canada, thirty-eighth annual conference and exhibition, Quebec City, Que.

JUNE

1-3 Tenth annual Short Course on Gas Technology, Texas College of Arts and Industries, Kingsville, Tex.

5-9 Canadian Gas Association, annual meeting, Sheraton-Broeck Hotel, Niagara Falls, Ont.

6-9 Oil and Gas Power Division, American Society of Mechanical Engineers, 27th annual conference and engineering exhibit, Hotel Statler, Washington, D. C.

6-10 American Petroleum Institute, Division of Production, midyear committee conference, Brown Palace Hotel, Denver.

6-15 Fourth World Petroleum Congress, Rome, Italy.

7-9 National Oil Scouts and Landmen's Association, 32nd annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.

9-10 Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ont.

9-10 Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.

11-15 Petroleum Equipment Suppliers Association, annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.

12-17 Society of Automotive Engineers, golden anniversary summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

16-18 Interstate Oil Compact Commission, Cosmopolitan Hotel, Denver.

20-23 American Society of Mechanical Engineers, semiannual meeting, Statler Hotel, Boston.

23-24 Western Petroleum Refiners Association, technical-industrial relations meeting, Broadview Hotel, Wichita, Kans.

23-26 Rocky Mountain Oil Show, Casper, Wyo.

26-July 1 American Society for Testing Materials, Chalfonte-Hadden Hall, Atlantic City, N. J.

AUGUST

15-17 Society of Automotive Engineers, golden anniversary West Coast meeting, Hotel Multnomah, Portland, Ore.

SEPTEMBER

11-13 Independent Natural Gas Association of America, annual meeting, Jasper Park Lodge, Jasper Park, Jasper, Alberta, Canada.

13-24 First International Instrument Congress and Exposition, and ninth National Instrument Conference and Exhibit, Philadelphia.

14-16 National Petroleum Association, 53rd annual meeting, Traymore Hotel, Atlantic City, N. J.

22-23 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

22-23 Louisiana - Arkansas Division, Mid-Continent Oil and Gas Association, annual membership meeting, Roosevelt Hotel, New Orleans.

26-28 American Association of Oilwell Drilling Contractors, fifteenth annual meeting, Rice Hotel, Houston.

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

Dam Foolishness

A PUBLICATION of the U. S. Chamber of Commerce, devoted to spreading propaganda in favor of that nearly lost cause, private enterprise, criticizes the popular notion that the Government should build lots of big hydroelectric dams to provide "cheap power." It notes that it takes a ton of water falling a distance of 1 mile to equal the power of a pound of coal.

Our demon statistician, John Casper, goes the chamber one better. He figured out (check him if he's wrong) that 1 ton of water falling 1 mile (biggest dam project we ever heard of) generates 10,560,000 ft.-lb. of energy, which is equal to 13,582 B.t.u. But 1 pt. of residual fuel oil—just 1 pt., mind you—contains 18,750 B.t.u.

Now if that is so, and we have no reason to doubt it, the question arises why should the Government spend a lot of the taxpayers' dough building these dam projects when it could get so much more energy out of residual fuel oil of which there is plenty and which refiners have trouble getting rid of even at low prices?

The Government is always broke and always screaming for more taxes to spend on its dam projects. But in order to sell the electricity cheap it has to charge up part of the dam cost to flood control, irrigation, navigation, or recreation. Instead of trying to cut out the oil industry's depletion allowance to get more revenue for this dam foolishness, the Government ought to encourage people to find and produce more of this 18,750-B.t.u. per pint stuff. Then we would really have cheaper power.

But this idea probably never will be very popular. You can't build a summer cottage or run a motor boat on an oil reservoir.

Tax on Air

FOR many years people have been talking about a tax on the air we breathe as being the ultimate in government regulation, taxation, and regimentation. Now it is proposed that Los Angeles, which has pioneered in giving these United States a good many novel things we never would have had without it, should lead the way in a tax on air.

It's on account of the smog. The smog has got so bad lately that the Angelenos are almost in a mood to pay a special tax in order to get a breath of fresh air. At least, one promoter thinks they are, and has offered to design and build an air-conditioning system for the entire county in exchange for a few hundred million tax dollars.

The proposed desmoggery would consist of a network of pipelines designed to pick up the polluted air around all oil refineries, factories, backyard trash burners, Greek restaurants, and other generators of noxious odors, and dump it far out in the Pacific Ocean where the Japan Current would take it down to Mexico. An alternative proposal is to pipe the smog to the tops of the mountains and let the west wind distribute it in the general direction of Las Vegas, Nev. (The dizzy gamblers in that den of iniquity don't know the difference between night and day anyway).

With all the smog pumped out of the Los Angeles Basin, it is presumed that fresh, breathable, life-sustaining air would waft its way in from Catalina Island or some place, and the city would see daylight again. The local residents certainly should be willing to pay a tax for that. But they wouldn't have to bear all the cost. The refineries, etc., which use the system would pay a monthly charge just as they do for water, sewer, and other utilities.

So far as we can determine, no oil refinery has signed up for this smog-removal service as yet. Apparently the refiners figure that free private enterprise still is better than any tax-supported, government-operated venture, smog or no smog.

But we have just run across a startling bit of information which may change the whole picture. Scientists now believe that heavy smog greatly reduces the damage and loss of life from an A-bomb attack. So this would make Los Angeles the safest city in the country in the next war (provided it doesn't go through with this scheme to export all its smog). And other cities can be expected to set up smudge pots all over to manufacture smog at the drop of a siren. So maybe all of us will be taxed to breathe smoggy air.

—Henry D. Ralph.

Safe Practical Positive...

You never need to risk breaking down a comparatively weak formation by high cementing pressure and the extreme weight of a long cement column. You can cement a well with *two producing* zones, and be assured of a good, uncontaminated cement job for the upper zone.

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Fast, simple, positive two-stage cement jobs are accomplished in a routine manner with the Baker Model "F" Stage Cementing Collar (Product No. 200-F) in combination with other Baker Equipment. In addition to positive, mechanical closing of the cementing ports upon completion of the second stage, you are assured of these outstanding advantages . . .

1. The cementing ports of the Stage Cementing Collar may be opened at any time after completion of the first stage, and fluid may be circulated through the stage collar for any desired length of time before starting the second-stage cementing.

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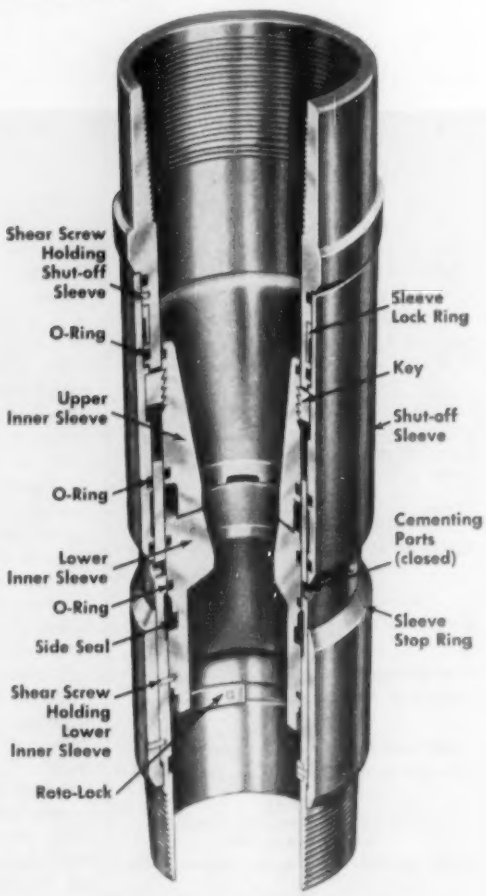
3. Operation of the stage collar is effected by fluid pressure applications only, and no movement of the casing is required after the first-stage cementation has been completed. Baker Stage Collars operate perfectly in either deep or shallow wells, even under difficult well conditions.

4. All internal parts of the Baker Stage Cementing Collar – including the Trip Plug and the Shut-off Plug – are constructed of readily drillable magnesium and/or rubber. When the internal mechanism of the Collar is drilled-out, the operator is left with a FULL CASING BORE free from "tool-catching" and "rubber-slashing" shoulders or projections.



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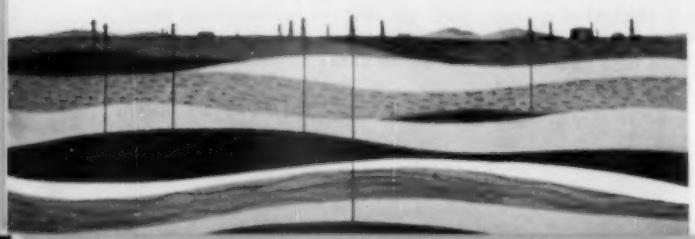

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What happened to reserves in 1954?

THE 1954 reserves report of the A.P.I.-A.G.A. committee is a matter of surprise to the entire industry.

The committee assigned 1954 the lowest net increase in reserves of crude oil and natural gas of any year since the war—and a net decrease in natural-gas liquids.

Yet 1954 was a banner year for drilling. It set a new record in total wells completed, and wildcats were virtually equal to the 1953 figure. The success ratio was about the same as in the past several years.

Operators were not aware of any indication that, by and large, the successful wells—either wildcat or development—proved up substantially less oil and gas per well than in other years. Withdrawal of crude was below 1953, and production of natural gas and gas liquids was only moderately higher.

Unofficial estimates and the opinions of many exploration men were that reserves had increased about as much in 1954 as they had in 1953.

IN VIEW OF ALL THAT, why are the A.P.I.-A.G.A. figures so low? The committee gave no explanation. This is unfortunate, because it has started speculation in many quarters.

Some think the committee just plain figured wrong and underestimated the significance of the year's discovery and development achievements. Others suggest that the group may be shifting to a more conservative method of estimating. Most people will realize that a large percentage of 1954's wells probably tapped reserves which already had been counted.

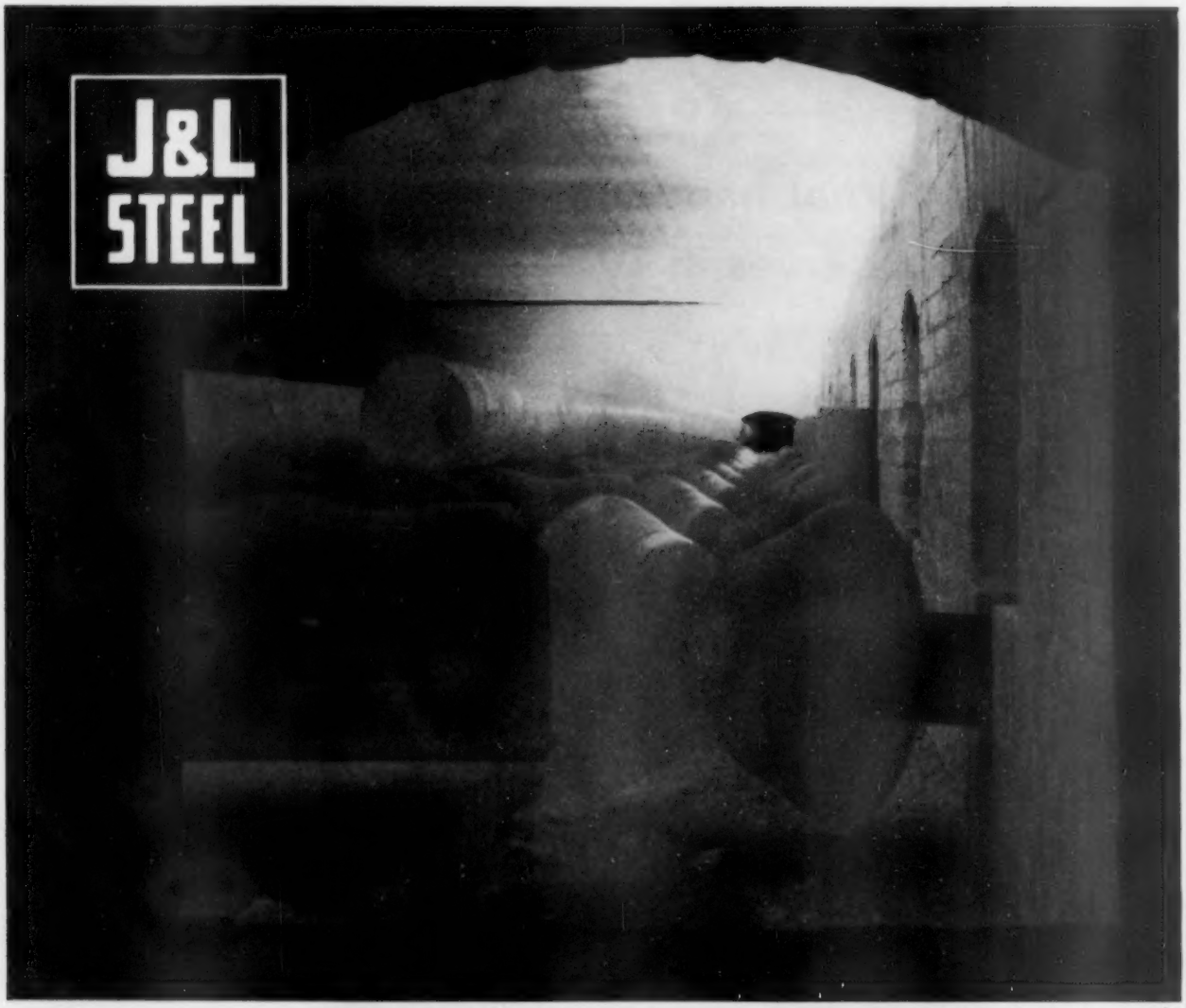
Still others feel that the committee may have had some special reason for preferring the low side of all 1954 estimates. One such reason might be a conviction on the part of the committee that its estimates for 1953 or some prior year were out of line on the high side and should be compensated in the other direction.

WHATEVER THE EXPLANATION, care should be used in drawing conclusions from the reserves report.

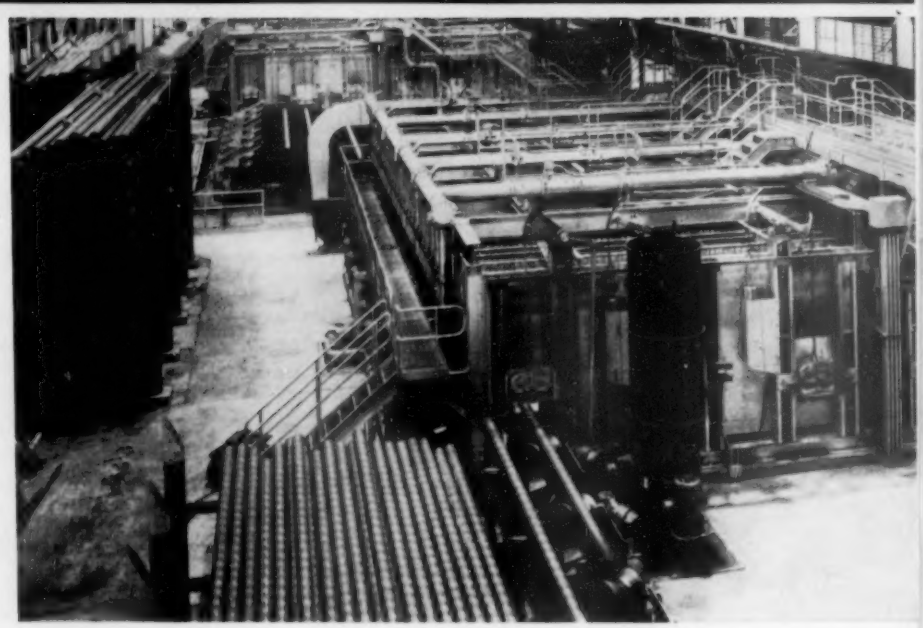
It should be remembered that all reserve figures are estimates—educated guesses. No two will be just alike, no one exactly right. Errors usually average out among estimators and among years.

But two things are certain. First, we can still find a lot of oil and gas in this country if we do enough drilling, regardless of disputes over the exact amounts discovered.

Second, the joint reserves committee muffed a big chance to serve the industry by failing to explain its puzzling figures. All the speculation, questions, and reservations could have been eliminated. All that is needed is a brief statement telling why this group of experienced and respected oil men arrived at the conclusions they did.



INTERIOR of high temperature 1650° F. furnace. The pipe moves through slowly from left to right on the conveyorized furnace bottom, passes out the exit door in the background.



OVER-ALL VIEW of J&L's new Seamless Tube Specialties Department at Aliquippa, Pa. High strength seamless steel pipe progresses automatically from the feed table in the foreground, through the heat treating furnaces in the center of the picture and into straightening, cutting and threading machines.

MORE HIGH STRENGTH CASING

J&L installs unique hearth type furnaces and quenching unit to meet driller demand

Drillers' growing need for an increased proportion of high strength steel casing is being met by J&L Steel through the addition of new facilities for the production of oil country tubular products.

Called the "Seamless Tube Specialties Department," the newest addition employs equipment of J&L design . . . makes possible the finishing of oil country casing by a quench and temper heat treatment that produces characteristics formerly attained through adjustments in the chemical composition of the steel. The result: by speeding up and improving its finishing facilities, J&L can furnish deep well drillers with more high strength casing up to 110,000 p.s.i.

If you're concerned with deep well drilling, J&L offers you a dependable source of high strength material.

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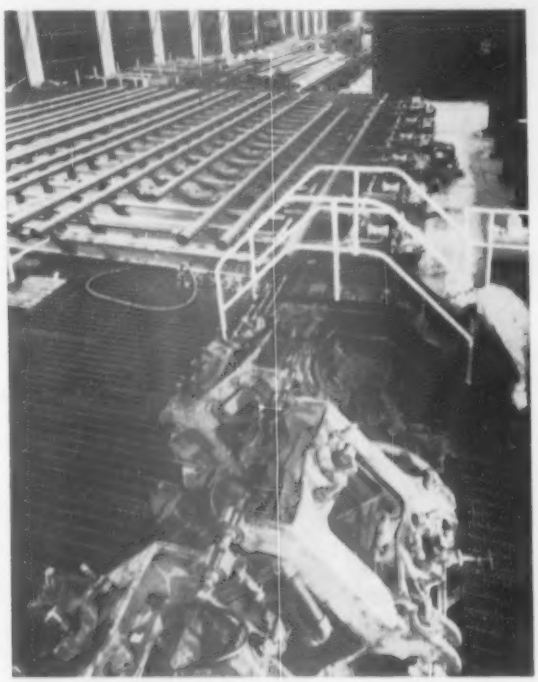
LINKED BY WATER
TO THE MIDDLE WEST AND SOUTH

J&L STEEL

KENNETH NICHOLSON, turn foreman, checks 7-inch O.D. seamless oil well casing going into the No. 1 high temperature heat treating furnace. In this mechanically-operated, hearth-type, gas-fired furnace the pipe is normalized.



A THREE-STAND REDUCING MILL, foreground, at the exit end of the No. 2 tempering furnace, sizes the pipe to exact diameter. The No. 2 cooling bed in the upper left quarter of the picture moves and assembles the pipe for further processing.

For Extra Sulphate Resistance

● Where sulphate attack is encountered, it takes a cement with special sulphate-resisting properties to protect casing against corrosion. That is why *extra* sulphate resistance is built into 'STARCOR' Oil-Well Cement and 'INCOR' Sulphate-Resistant Cement. What this means in resistance to sulphate action is shown by tests in Lone Star Oil-Well Cement Research Laboratory.

These bars of neat cement were photographed after exposure to a 4% sodium sulphate solution. The two bars, at left, made with cement without special inbuilt properties of sulphate resistance, show disintegration after 30 days—while the bar at right, made with cement with special sulphate-resisting properties, is unaffected after years of exposure.

For protection against the action of sulphate soils or waters, use 'STARCOR'* Oil-Well Cement or 'INCOR'* Sulphate-Resistant Cement. It pays to select cement to fit the job.

*Reg. U. S. Pat. Off.

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THIS WEEK . . . . . IN THE NEWS

Production

• L.P.G. flooding may emerge as an accepted procedure as a result of tests planned by three operators in Texas. Shamrock Oil & Gas, the firm that accidentally conducted a successful L.P.G. flood at an underground storage project, has a flood mapped for Moore County. Petrocel Corp. also has a flood planned, while Frank Buttram, Oklahoma City operator, will conduct further tests in hope of throwing light on an L.P.G. flood that as yet has not been successful.

• New additive developed by Continental Oil Co. promises to improve formation fracturing while reducing costs about 50 per cent. The additive cuts loss of fracturing fluid into the formation.

• Fracturing of wells in water-flood projects is proving successful in eastern Kansas fields. New methods make a number of small fractures close to the well instead of fractures extending far into the producing formation.

Imports

• Secretary of State Dulles opposes legislation curbing oil imports. He says "good progress" is being made toward voluntary controls.

• Imports of crude and products during the first 7 months of 1955 will be considerably higher than for like period a year ago. Reports to Texas Railroad Commission indicate biggest gain—42.8 per cent—will be in crude entering West Coast ports.

• Imports in January were slightly below the December total but far greater than a year earlier.

Government

• The industry-backed Harris bill exempting natural-gas producers from federal control has won the support of the FPC. Chairman Jerome K. Kuykendall spoke for the commission, declaring Congress never intended for producers to come under his agency's control. He also said the FPC does not want such control.

• Private companies will take over the Government's synthetic-rubber plants. Congress virtually approved the sale last week, clearing the way for the switch from government to private control. The plants brought in $310,765,000.

Technology

• A new refining technique developed by Houdry Process Corp. will convert a refinery's entire reduced-crude output into high-value products. Known as "Houdresid," the new process was uncovered last week following a full year's test by Sun Oil Co., Ltd., at its Sarnia, Ont., refinery. Although slightly more expensive than a conventional Houdriflow unit, the Sarnia facility paid for the extra cost in a few months.

Industry

• Sinclair Oil Corp. increased its production 2,600 bbl. daily by acquiring the properties and assets of American Republics Corp. The $108 million deal included probably the largest production-payment transaction in the industry's history. Sinclair will pay out $75 million with production payments.

International

• United Nations report blasting the oil price structure in Western Europe sets off international uproar. The report draws rebukes from U. S. and British governments, as well as from American oil companies operating overseas.

• Brazil hopes to meet 80 per cent of its products requirements by end of the year. First oil discovery in the Amazon basin may further reduce the country's reliance on imports.

• Another South American country—Bolivia—is about ready to invite more foreign money to back oil exploration.

Exploration

• Hugoton embayment, one of the exploration hot spots of last year, is expected to have an even bigger year in 1955. The three leading areas in the embayment are Kansas' Kiowa County, Oklahoma's Beaver County, and the Texas Panhandle.

• Texas has a new offshore field. It was opened by Magnolia Petroleum 8 miles off Jefferson County at the southeastern tip of the state. The discovery well is rated at 25 million cubic feet of gas daily. The field is Texas' fifth offshore.

Pipelines

• It'll be 1956 before Trans-Canada pipeline is started. Financing troubles are delaying the $300 million project, which was scheduled to get under way this year.

• A new plan for a Texas-to-Florida natural-gas pipeline has been developed by Coastal Transmission Co. and Houston, Texas Gas & Oil Co. The 30-in. line would run from McAllen, Tex., to Miami, Fla. Still needed by the backers are FPC approval, sales outlets, financing, and a gas supply.

Sources and Volumes of Middle East Flare Gas

Field—	Approx. G.O.R.*	Crude-oil† production (bbl. per day)	Gross gas‡ production (M.c.f. per day)
SAUDI ARABIA			
1. Ghawar:			
Uthmaniyah	450	100,000	45,000
Shedgum	450	100,000	45,000
Ain Dar	560	290,000	162,400
2. Abqaiq	770	300,000	231,000
3. Qatif	800	37,000	29,600
4. Dammam	600	52,000	31,200
Total or average	619	879,000	544,200
KUWAIT			
5. Burgan	475	1,000,000	475,000
IRAQ			
6. Kirkuk	200	500,000	100,000
7. Zubair	650	100,000	65,000
8. Rumaila	700	60,000	42,000
Total or average	314	660,000	207,000
IRAN			
9. Masjid-i-Sulaiman	40	34,300	1,372
10. Haft Kel	80	52,000	4,160
11. Naft Safid	165	7,500	1,237
12. Agha Jari	151	240,000	36,240
Total or average	129	333,800	43,009
QATAR			
13. Dukhan:			
No. 3 pay	700	16,500	11,550
No. 4 pay	1,200	93,500	112,500
Total or average	1,128	110,000	124,050
BAHRAIN			
14. Bahrain	167	30,000	5,000
Total all fields or average	464	3,012,800	1,398,259

Plans are being made, but . . .

. . . Is Middle East Gas Available?

Dahl M. Duff

A LOT has been said lately about the possibility of large-scale use of flare gas in the Middle East. It's not as easy as it seems to be.

Gas is not as plentiful or as readily available in the Middle East as some people apparently think.

This is the view of a number of oil men who are involved in Middle East operations. Of course, the region's tremendous oil production (more than 3,000,000 bbl. daily in December) naturally results in a large output of oil-associated gas. But here are some of the considerations:

. . . **Gas-oil ratios are low,** and in the absence of dry gas fields, large-volume users would tie themselves to the level of oil production.

. . . **Pressure maintenance** already takes a large amount of available gas, notably in Saudi Arabia. More and more gas probably will be needed for this purpose.

. . . **Gas is being used** in each of the producing countries for field and utility use. This gas is being used to drive pump turbines and provide fuel for power plants, water-distillation units, and some local industries.

Expensive gathering systems and trunk lines would be necessary in most cases to bring oil-field gas to a central point for large-volume use. The fields in the Kirkuk area of Iraq, for example, are 500 miles from tidewater.

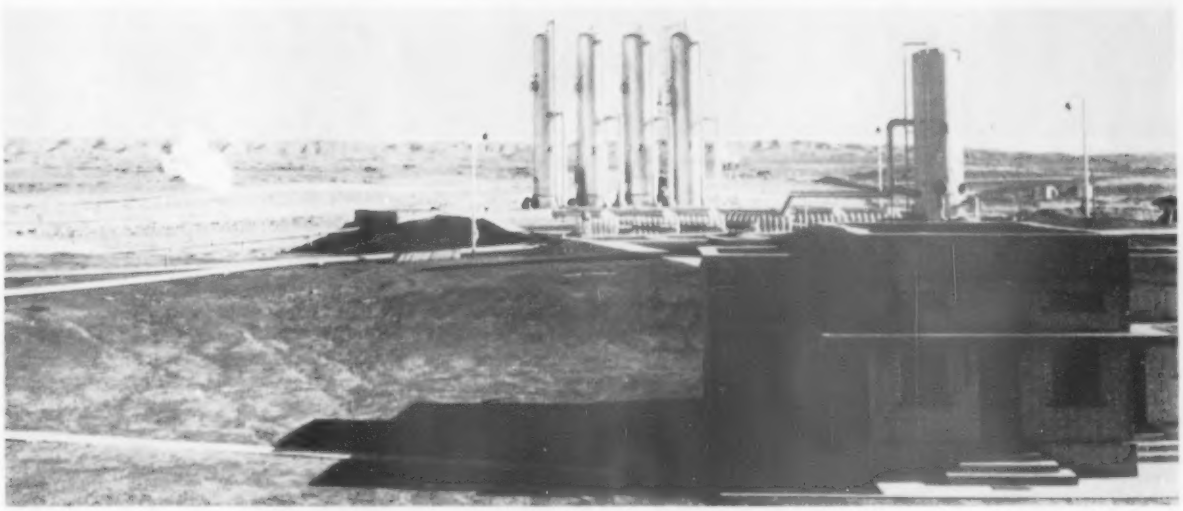
Most of the oil companies in the Middle East have been studying ways to make economic use of their waste gas for years. In 1951, Bechtel International Corp. advanced a plan for a 2,500-mile gas pipeline from Iraq to Paris, France. About a year ago, the Foreign Operations Administration came up with an optimistic study on gas liquefaction in Saudi Arabia. More recently, a West German group surveying development prospects in Saudi Arabia has been looking into gas.

Around 1,398 million cubic feet of gas is being produced each day in the Middle East (see table). This is the gross output of oil-associated gas and includes the gas used and flared.

Saudi Arabia . . . The recent talk of using gas in large volume in the Middle East has centered mostly on Saudi Arabia. The FOA study dwelt on Saudi Arabia. Since then, a United States group, International Development Services (originally backed by Nelson Rockefeller) has signed a 14-month

*Gas-oil ratios are ratios of gross gas production to oil production shown. For Iran, G.O.R.'s are from data published before 1951. †Estimated daily average 1955 output. Rumaila field figure is estimate for end of 1955. ‡Includes all field and utility use.

HORIZONTAL SEPARATORS in Kuwait handle about 100,000 bbl. of crude oil daily.



VERTICAL SEPARATORS in Kirkuk field in Iraq. Waste gas is being flared at left.

option for exclusive rights to the gas. International Development Services' option is from the Saudi Arabian Government.

Saudi Arabia's fields have a gas-oil ratio of about 619:1, and gross gas production in the country runs to some 544 million cubic feet daily, largest of any of the Middle East producing countries. This volume of gas is equivalent to about 91,000 bbl. daily of oil fuel. On paper, it presents a dazzling opportunity.

A closer look, however, shows that Arabian American Oil Co. has no gas at all available in Abqaiq and its fields to the east, namely Qatif and Damman. This leaves the vast Ghawar field, to the west, and it's entirely possible Ghawar's gas may be needed for pressure maintenance in the next few years.

Qatif and Damman together have a gas production of about 60 million cubic feet daily, but all this is being used internally by Aramco. Qatif's gas moves to the power plant and to Dhahran. Damman's production is taken for fuel, and Aramco actually needs more gas in the Damman area than it has there at present. At Damman are three Brown-Bovari gas combustion turbines, each of 5,000 kw. and taking 3,000,000 cu. ft. at full load. Another 10,000 kw. unit is being installed.

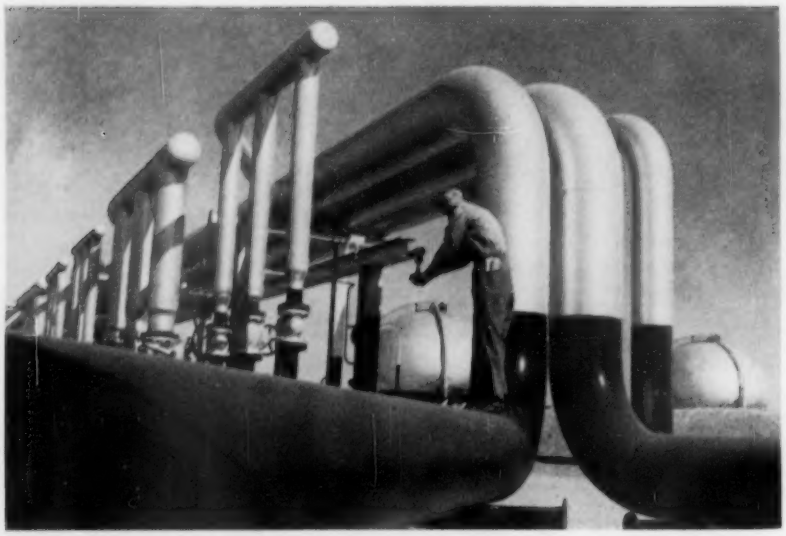
At Abqaiq, the Aramco gas reinjection plant takes 175 to 180 million cubic feet daily, all the field's high-pressure (500 psi.) gas. Abqaiq has about 26 million cubic feet of intermediate-stage (200 psi.) gas, but this probably will be used eventually in an expansion of the injection program. The 33 million cubic feet of low pressure gas (40 psi.) at Abqaiq goes for fuel.

The Abqaiq injection plant is the first large project of its kind in the Middle East, but studies are being made in other fields, especially in Iraq, and it is a good bet that a growing volume of Middle East gas will go into pressure-maintenance operations. Field performance is under constant study by operating companies. As yet, most of them don't know where they stand on this problem, but no company that may need its gas to hold up future oil production could be expected to commit it to some other use over a 15 or 20-year period.

Pressure maintenance is a possibility at Ghawar. The field, stretching over 125 miles north and south, ranks as the largest in the Mid East and will provide a growing proportion of Saudi Arabian oil output. Its three segments have a gross gas production of around 252 million cubic feet daily, but it will be 3 or 4 years and maybe longer before Aramco knows whether pressure maintenance with gas will be necessary. This is especially the case with Ain Dar which has a pressure connection with Abqaiq.

Not all the gas coming from Ghawar's six gas-oil separator plants is being wasted. The high-pressure gas in the field is used to drive gas-expansion turbines. In Uthmaniyah, a power plant will take part of the low-pressure gas. But the big question of availability of Ghawar gas is the possible need for repressuring.

Bahrain . . . The 5 million cubic feet of gas production accompanying Bahrain's 30,000 bbl. daily oil output is a drop in the bucket in the total Middle East gas picture. Bahrain Petroleum Co., Ltd., for many years has tapped a deeper high-pressure sand for gas to



THESE VERTICAL TRIPLETS of pipe at Aramco's Buqqa separator relieve pressure built up by hydrogen sulfide as it is released from crude oil.

inject into the oil formations. Some additional gas probably could be made available from this deeper zone, but the amount falls far short of paying the costs of a pipeline to move it to a possible collecting point in Saudi Arabia. In addition to this, there would be the cost of drilling additional gas wells.

In Abqaiq, the bulk of the oil comes from Kirkuk field which is linked to Eastern Mediterranean terminals by long-distance pipelines. The field has a low gas-oil ratio, and heavier withdrawals beginning about 2 years ago with the completion of the 30-in. line to Banias, Syria, have raised the possibility of pressure maintenance with gas, or gas-lift operations. Some Kirkuk gas now is taken as fuel in the company's own operations.

Iraq . . . Iraq Petroleum Co., Ltd., also is watching pressure trends in Zubair field in the southern part of the country. Studies of the field are under way, and it is not likely this gas would be available for any large-scale export operation such as liquefaction. A companion is the new Rumaila field a few miles to the west. Rumaila was recently brought on production to back up Zubair's oil output.

The Iraq Government is pushing an extensive internal development program based on its oil revenue, and some of these projects depend on a supply of gas for fuel. Three years ago, the World Bank surveyed Iraqi resources and submitted a plan for domestic production of ammonia fertilizers, sulfur, carbon black, and cement from the country's natural gas. Such projects presumably would take most of whatever Kirkuk gas might be available.

Of the four major oil countries of the Middle East, Kuwait, offhand, seems to offer the best prospect for large-scale gas supplies. Crude production in 1955 probably will range around a million barrels daily, making it first in the Middle East. Most of this output comes from Burgan field which has a gas-oil ratio of around 475:1.

Kuwait . . . Of the approximately 475 million cubic feet daily coming off the separators in Kuwait, around 10 per cent is now being used by the company for pump drive, water-distillation plants, plant fuel, etc.

According to reports in the industry, Burgan field has a near-perfect water drive which makes it unlikely that the gas will be needed later for pressure maintenance. Furthermore, the fields—Burgan as well as the two associated areas of Ahmadi Ridge and Magwa—are concentrated in a small area close to the Persian Gulf coast.

Iran . . . The eight-company group which took over oil operations in southern Iran last October is busy with the problems of boosting oil production and refinery output without considering usage of flare gas. Though the fields have low gas-oil ratios, there are some unanswered questions as to their behavior after being closed in for more than 3 years. It is known that Anglo-Iranian Oil Co., Ltd. (now British Petroleum), studied gas usage, including liquefaction, before 1951 when it was in control of properties.

It's all wet gas . . . One point to remember is that there are no dry gas fields as such in the Middle East. Pazanun, one of the string of seven fields in Iran, is considered a condensate reservoir and has a gas-oil ratio of 3,500:1. It was produced for a short time during World War II to provide light fractions for aviation-gasoline manufacture at Abadan at a time when crude production and refinery operations were cut back.

Some strictly gas reservoirs have been tested in various parts of the Middle East, including the general area of Kirkuk. But the emphasis has been on oil production.

The economics . . . Availability of gas in the Middle East is one thing. The economics involved are something else. Most oil men connected with Middle East operations and familiar with costs remain to be convinced that it's possible to do more than set up local gas-using industries such as those planned in Iraq.

Even some of these local industries such as sulfur, fertilizers and carbon black, might require a government subsidy to exist. Markets for the products are nonexistent or at best limited. In most of the Middle East, a good index of construction costs is from 2 to 2½ times those in the United States. The figure includes bringing materials half way around the world, importing virtually all skilled labor, providing them with housing, etc. This dims the outlook for high-cost petrochemical plants depending largely on export markets.

The Bechtel pipeline scheme never received too serious a reception because of the political angles. The route ran through Syria, Turkey, Greece, Yugoslavia, and nothern Italy, Switzerland, and West Germany. Part of it was next door to the Iron Curtain of Communist Europe. Problems of right-of-way and international agreements seemed almost insurmountable.

The sale of gas would be something less than a bonanza to the Middle East governments, the larger of which are now receiving from $150,000,000 to $200,000,000 a year from oil production. The basis of most of the projects is a supply of low cost, cheap gas. The FOA report figured, for example, that there was 500 million cubic feet daily available in Saudi Arabia which would cost an average of 3 cents a thousand cubic feet.

While 500 million cubic feet is far more than what Aramco could make available, disregarding future pressure-maintenance needs, that amount at 3 cents would bring in only $15,000 a day, or $5,475,000 a year. Assuming this is split between the government and the company as is usual in the Middle East, the government would get $2,737,500 a year. Oil revenue piles that up in only 5 days.

New Cracking Process

"Houdresid" designed to convert entire bottoms fraction to distillates without significant damage to catalysts

NEW YORK.—A refinery's entire output of reduced crude can now be catalytically cracked efficiently and profitably, according to Houdry Process Corp.

A new process—"Houdresid"—was unveiled by Houdry late last week. With it, the company said, a refiner can free himself of the problems involved in marketing asphalts and No. 6 fuel oil. Houdresid, the company said, will eliminate low-value products by converting them to gasoline and furnace oils.

This new departure in catalytic conversion has just completed a full year's successful operation on a commercial scale at the new Sarnia, Ont., refinery of Sun Oil Co., Ltd.

This full-scale trial, says Houdry, has demonstrated that a way has been found to mitigate the effect of heavy metal contaminants on the catalyst. These deposits have resulted in no significant loss of catalyst activity or selectivity.

Available for licensing . . . Neither Houdry nor Sun claims to be the first to charge residuals to a cat cracker.

Some bottom fractions from selected crudes have been blended to cat feed stocks by several individual refiners in the past. And the whole topped crude fraction is being catalytically cracked at the new Mandan, N.D., refinery of Standard Oil Co. (Ind.). But these practices are possible on only certain crudes having low metal content.

The more general use of this technique is now made possible by development of a catalyst and a set of operating conditions which lessens poisoning of catalyst by such metals.

The Houdresid process, based on the moving-bed Houdriflow principle, is now available for licensing.

Sun's results . . . Sun's Canadian subsidiary has been charging a mixture of Texas, Louisiana, and Mid-Continent crudes to the 16,650-bbl. per day refinery since it began operation over a year ago.

The reduced crude fraction from the atmospheric unit, representing about 50 per cent of whole crude, has been charged, together with atmospheric gas oil, distillate, and heavy recycle, to the reactor of the 11,000-bbl. per stream day Houdresid unit. From this reduced crude fraction a yield of about 64 per cent of high-octane gasoline has been obtained, according to Houdry and Sun.

This compares with a yield of 52.5 per cent gasoline which would have been obtained by conventional vacuum distillation followed by catalytic cracking of the vacuum gas-oil fraction.

The Sarnia Houdresid unit cost a little more than a conventional Houdriflow unit, and its operating costs are slightly higher. But these increments are more than offset by the higher value of the products obtained, according to Houdry. The payout took only a few months.

Sinclair Deal Tops

Record oil payment involved in $108 million purchase of American Republics Corp., cash outlay $33 million

NEW YORK.—Probably the largest production-payment transaction in history of the industry was completed in Wilmington, Del., last week when Sinclair Oil & Gas Corp. acquired properties and assets of American Republics Corp.

Payment out of production is $75,000,000. The deal was worked out by Lehman Brothers, New York investment banking firm, and financed by a group of eight banks. The remaining $33,000,000 of the total $108,000,000 purchase price was supplied by Sinclair Oil & Gas. Besides the $108,000,000 cash, American Republics also is receiving certain expenses involved in its current liquidation.

The production payment method has become a popular technique of acquiring oil properties in the last few years. The $75,000,000 involved in the Sinclair-American Republics deal is payable, plus interest, out of production from some of the properties. But it does not constitute an indebtedness or financial obligation of Sinclair.

The transaction placed Sinclair, the domestic producing subsidiary of Sinclair Oil Corp., in control of the properties as operator. It added about 2,600 bbl. daily to Sinclair's production. Balance of production now amounting to around 12,500 bbl. daily will be used to extinguish the production payment.

At present market prices for crude, retiring the production payment will require about 31,500,000 bbl. American Republics reserves of crude and gas liquids, including gas reserves in terms of their dollar equivalent in crude, are variously estimated at 64,000,000 to 70,000,000 bbl.

The properties are situated principally in the Texas Gulf Coast and southeastern Texas. They include 385 net producing oil wells and 39 net gas wells. Undeveloped properties, mostly free of royalty and development obligations, total 828,000 net acres of which 546,000 acres are mineral-fee holdings and 282,000 acres are under commercial lease.

The rest of the assets include an office building in Houston, gasoline and pressure-maintenance plants, and a small crude-oil gathering and transportation pipeline system.

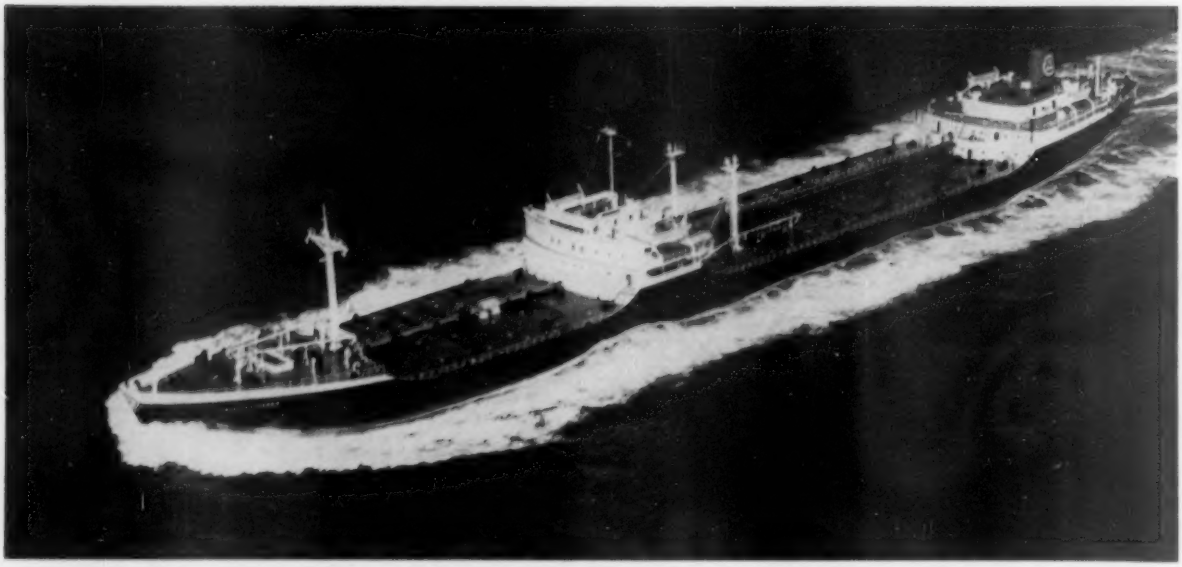
P. C. Spencer, Sinclair president, said the company would begin an active exploratory and drilling program on some of the undeveloped acreage. This, he pointed out, may result in new production which could "substantially accelerate" final retirement of the production payment.

Stockholders of American Republics Corp. voted February 11 to liquidate the company in order to carry out the sale to Sinclair. They are expected to receive about $72 a share for their common stock.

Ashland Plans Expansion

ASHLAND, Ky.—Catalytic reforming and hydrodesulfurization facilities are planned by Ashland Oil & Refining Co. at three refineries. No decision has been announced on what processes will be used in the new units.

Three hydrodesulfurizers will be built—a 5,000-bbl. unit at Buffalo, an 8,500-bbl. unit at Catlettsburg, Ky., and a 4,000-bbl. unit at Findlay, Ohio. The company is building a 6,000-bbl. Houdriformer at Catlettsburg and will add a 4,000-bbl. unit to the Buffalo refinery and a 3,000-bbl. unit at Findlay.



CITIES SERVICE supertanker W. Alton Jones . . . too few like her built in U. S.

Foreign Tanker Boom Worries U.S.

- Only nine oil ships under way in American yards, 217 abroad; lower costs, use of blocked funds are big factors
- Trend is toward supertankers, financed by nonoil firms under long-term charter and flying alien flags

Bertram F. Linz

WASHINGTON. — American shipyards are starving for business. But foreign shipbuilding booms.

What to do about it is a grave concern to both the shipping industry and the Government with the oil industry an interested bystander.

Foreign builders have received orders for more than 1,300 cargo ships and oil tankers since the end of the war. Only 16 ships of both classes are being built in the United States.

Costs a factor . . . Contracts for foreign-built tankers currently number 217. Only nine tankers are being built in this country, four of them for the Government.

Why this shift of business?

Simply stated it is this: Yards abroad can undersell American builders because of lower labor and material costs. American oil firms abroad also can pay for ships with their money blocked by foreign governments.

Rep. Alvin E. O'Konski of Wisconsin discovered that lower labor and material costs were the big reasons foreign shipbuilders could get the business. He reported in the case of tankers blocked currency held by American oil companies abroad was an added factor.

The cargo and oil ships completed and abuilding overseas, he found, will cost $600 million less than they would in this country.

The federal Government has tried to step up new shipbuilding. Our aging tanker fleet has been a worry to officials for some time. Last year Congress took steps to correct the deficiency. It authorized the Navy to build 4 tankers and make long-term charters on 15 others to be built for it.

Government aid . . . Congress also authorized a trade-in-and-build plan. The Maritime Administration, under the program, may take over aging tankers and allow owners credit toward new vessels. By year's end the Maritime Administration had contracted to take 12 old tankers for credits against construction of 5 new ones.

Last year 15 tankers were built, but 53 were withdrawn from the fleet. Today, the United States has 405 vessels totaling 6,634,568 deadweight tons. That is 38 ships and 320,000 tons less than it had a year ago, according to figures gathered by the American Merchant Marine Institute.

O'Konski suggested our shipyards should be made more competitive, not through lowering our standard of living but through greater efficiency and government aid. He figured it would have cost the Government $67,000,000 a year to have switched much of the foreign-built tonnage to American yards. The net cost to the Government, however, would have been much less, because it would have collected more than $50,000,000 a year in taxes.

O'Konski found that well over 100 tankers have been ordered abroad by American oil companies. Some of them have been built by subsidiaries to carry oil to their markets. But a large number also have been ordered by nonoil interests, financed by bank and insurance company loans, for long-term charter to oil companies.

Trends noted . . . The oil industry has encouraged tanker building by independent investment groups, he said. The companies then can keep their capital for the development of producing properties and marketing needs. Lower-cost construction means savings to them in charter rates.

Another trend is larger tankers. Shipbuilding figures showed the 217 ships ordered abroad total 5,100,828 deadweight tons. Most of them are large, running as big as 48,000 deadweight tons.

"This has proven economically feasible because of the long hauls involved and the constantly spiraling cost of shipboard labor, upkeep and maintenance," O'Konski explained.

"Along with this has come a new trend toward increased speed," he added. "Where one new 30,000 to 45,000-ton tanker now is displacing two and three smaller ones this same vessel with the sea speeds now being adopted is making almost twice the number of yearly voyages her prewar counterpart could."

Contracts recently placed, O'Konski found, included four tankers of 48,000 deadweight tons building in France, two of 47,000 tons in England and four of 39,000 tons in Japan.

A total of 57 tankers have been ordered from English yards in the postwar years, 49 from Germany, 36 from Japan, 29 from Holland, 16 from France and smaller numbers from Canada, Denmark, Norway, Italy, and Sweden.

Standard Oil Co. (N. J.) and its affiliates have ordered 45 tankers built abroad. Other oil companies placing orders in foreign yards are Standard-Vacuum Oil Co., 6; Socony-Vacuum Oil Co., 7; Tide Water Associated Oil Co., 6; Gulf Oil Co., 13; The Texas Co., 8; the Caltex group, 21; and Atlantic Refining Co., 3. Also, National Bulk Carriers have ordered 9, Atlantic Oil Carriers 14 and Olympic Oil lines 21.

World Tanker Fleet Grows

LONDON.—The world tanker fleet had a net gain of 57 vessels and 1,890,716 tons during the second half of 1954.

Delivery of 124 tankers totaling 2,538,365 tons during the 6-month period exceeded earlier estimates, according to John I. Jacobs & Co., Ltd., British tanker firm. Delivery rate also was greater than during the first half of the year.

During the second half, 67 tankers of 647,649 tons were withdrawn from service. Tankers owned by oil companies accounted for about 160,000 tons. At year's end there were 2,639 tankers of 2,000 or more tons totaling 39,014,509 tons.

Vessels sailing under the Liberian flag again showed the greatest increase with an addition of 850,000 tons. Deadweight under the United States flag decreased by 245,000 tons, largely as result of transfers to Liberian and Panamanian flags.

Ranking tanker fleets are: U. S., 8,469,289 tons, or 21.7 per cent; British, 7,280,785 tons, 18.6 per cent; Norwegian, 5,746,390 tons, 14.7 per cent; Panamanian, 3,401,054 tons, 8.7 per cent; and Liberian, 3,327,512 tons, 8.5 per cent.

Highlights . . . from Oil-Company Annual Statements

"Many industry problems remain, such as taxation trends, the imbalance between gasoline and distillate yields, the necessity of carrying stand-by capacity for security reasons, conflicting attitudes as to the proper role of imports, and a lack of full appreciation of the seasonal swings in demand. All of these matters are possible of adjustment, however, and there is no reason to believe that any of them may block progress."—*Gulf Oil Corp.*

"As we face 1955, we face a complex market situation. Among the problems to be met are the proposals made concerning restrictions of imports of Venezuelan crude and fuel oil into the United States, increased competition from other fuels, and the continuously expanding flow of oil from other producing areas. The company is fully aware of the powerful forces in the U. S. advocating import restrictions, and it is working to demonstrate the extremely adverse effect these restrictions would have on national defense, foreign trade and hemisphere relations.

"In the search for new crude oil reserves the company, in 1954, spent more than $30,000,000 including the cost of drilling 132 exploratory wells. Thirty-three of the 51 wildcat wells were successful and of the 81 outposts, 67 were producers, 2 were gas wells and 12 were dry holes."—*Creole Petroleum Corp.*

"Production of natural-gas liquids increased to 61,000 bbl. daily.

"A new combination of drilling-fluid ingredients developed by the company increased drilling speed and resulted in saving in drilling bits used. New well-logging procedures, a new meter for measuring flow of liquids in wells, and new methods for seismograph computations were developed. A low-density oil-well cement was formulated and successfully applied for better control of well-cementing.

"The research emphasis which led to introduction of new premium motor oil and motor fuel is being continued on fuel and lubricant developments for advanced engine designs of the future.

"The company is a member of the Rocky Mountain Nuclear Study Group . . . which was formed to investigate the technical and economic feasibility of a multipurpose nuclear reactor for the production of electrical power and fissionable and radioactive materials."—*Phillips Petroleum Co.*

"The principal factors adversely affecting net income for the year were lower crude oil production, higher depreciation and depletion charges, sharply increased exploration charges, and narrower profit margins in the company's refining, marketing, and transportation operations.

"The general economic outlook for 1955 is brighter and a more nearly normal increase in domestic petroleum demand may therefore be expected. . . . The stockholders are reminded, however, that intense competitive pressures will probably continue to prevail during 1955 as they did in 1954."—*Ohio Oil Co.*

"Capital expenditures in 1954 totaled $291,541,092. Of this amount $77,015,950 was spent for the installation of refining equipment most of which was provided to increase the octane quality of gasoline necessitated by continuing increases in the compression ratios of new automobile engines.

"Products developed during 1954 were an improved automatic transmission fluid for modern automobiles; a new diesel engine lubricating oil for higher-power-output railroad diesels; a new aircraft engine oil, the first of its type, with over a million miles successful proven performance; specialized fuels and lubricants for jet-powered aircraft; and a number of industrial lubricants."—*The Texas Co.*

"A recent announcement of great importance to eastern Montana was that a 16-in. crude line will be built by Shell Oil and Murphy Corp. Its completion . . . will increase the current market price approximately $1 per barrel."—*Montana-Dakota Utilities.*

"In 1955 it is contemplated that the underground storage facilities will be expanded so as to provide withdrawal capacity of 430 million cubic feet on days of maximum demand."—*Peoples Gas Light & Coke Co.*

"In the Denver-Julesburg basin of Northeast Colorado and the Nebraska Panhandle, the company completed 41 oil wells including 2 discoveries and 2 gas wells. Wildcat drilling indicated large additions to productive areas in which the company is well represented with promising acreage and where active developments are expected in 1955."—*Skelly Oil Co.*

Well-Fracturing Costs Halved

Conoco combines lease crude, additive into fluid which produces excellent results, Amarillo A.P.I. meeting told

Henry D. Ralph

AMARILLO.—Better formation fracturing at about half the cost is promised by Continental Oil Co. which uses lease crude and a new additive developed in its Ponca City laboratories.

The additive prevents loss of fracturing fluid into the formation. Continental says this has been the main trouble with all fracturing fluids used previously.

Continental has used its new additive in more than 150 wells. Results have been "outstanding, with oil-production increases consistently larger than those obtained through use of conventional fracturing fluids."

Report on the new process was made to the Mid-Continent district meeting of the A.P.I. Division of Production by three Continental men—Jack J. Reynolds, Phillip E. Bocquet, and Harry F. Coffer—all from Ponca City.

Superior fluid . . . The new additive is called Adomite, a complex mixture of sulfonates. It is available from a number of well-service companies. Adomite "converts lease crude into a superior fracturing fluid," the Conoco authors asserted.

Development of Adomite was not an accident. It grew from theoretical studies in the Ponca lab. The researchers wanted to know why sand fell out of the fracturing fluid and bridged the fractures before it had penetrated far. Another question: why large volumes and high pump rates failed to overcome this?

While others worked on viscosity, gravity, sand-carrying ability, and break-down fluids, Continental concentrated on fluid loss into the formation matrix. It sought an economical way of extending the depth of the fracture.

Researchers reasoned that as a fracture is extended, the fluid comes into more contact with the matrix. Therefore more fluid is absorbed by the formation and the concentration of sand increases. This causes the sand grains to bridge, stopping further penentration.

Proved in use . . . Field experience supported laboratory conclusions that sand-outs ordinarily begin in the fracture itself rather than while the mixture is traveling down the well. So it was concluded that fluid loss, rather than viscosity, was the explanation.

In addition to stopping fluid loss, Continental wanted to use lease crude because it is available at the site, is cheap, does not contaminate the formation, and doesn't annoy pipeline companies by contaminating the well's early production. Refinery residual, often used, has a tendency to form stable emulsions which take a long time to clean out of the well. Fracturing with viscous materials usually requires use of large amounts of flush oil to prevent sand from reentering the well bore.

Use of Adomite and lease crude, Continental found, effectively seals off the face of the fracture and prevents fluid entry. This results in longer fractures from an equal amount of fracturing fluid. However, this obstruction to the permeability of the matrix is temporary, and is readily removed by the backflow of formation oil when the fracturing is completed.

This reduction in fluid loss has eliminated the need for high pump rates and in some areas this factor alone has reduced fracturing costs almost in half, the authors said.

Water-Flood Aid

Formation unharmed by new fracturing method

AMARILLO. — Methods have been perfected for fracturing wells in water-flood projects without channeling or other injury to the formation.

Within the past year many operators have used formation fracturing in secondary-recovery projects in eastern Kansas with gratifying results.

This was reported to the Mid-Continent district meeting of the A.P.I. Production Division by James R. Paul and Charles W. Noble of the Wichita office of Dowell Incorporated.

The secret lies in making a number of small fractures close to the well bore instead of long fractures which reach far into the formation.

The Dowell duo explained the method of making small multiple fractures. The object is to create sand bridging in the fractures before they have gone far into the formation. To achieve this they used a fracturing fluid with a high viscosity and a high rate of fluid loss into the formation matrix.

The first fractures thus sand up before penetrating deeply. Further pressure then creates other, new fractures. In addition to special fluids, low or intermittent pump pressures are used. Still another technique is use of temporary plugging materials—graded particles which are self-liquefying and return to the well bore during the clean-up operation.

Industry Briefs

BATON ROUGE.—Louisiana's daily oil allowable for April will be increased 10,920 bbl. daily to handle new production. The increase boosts the figure to 695,332 bbl. daily. Totals by districts are Houma, 162,569 bbl.; Lafayette, 151,262 bbl.; Lake Charles, 66,209 bbl.; New Orleans, 192,260 bbl.; Monroe, 56,990 bbl.; and Shreveport, 66,042 bbl. Offshore production accounts for 58,570 bbl. of the New Orleans, Lafayette, Lake Charles, and Houma totals.

OKLAHOMA CITY.—The Oklahoma Corporation Commission set the same allowable for the state's oil pools in April as it did in March with the exception of 51 allocated pools in southern Oklahoma. The commission approved a reduction from 25 to 30 bbl. daily in these fields where purchaser proration began in February. The allowable is calculated to produce 565,000 bbl. daily.

LOS ANGELES.—Standard Oil Co. of California expects to spend $300 millions this year in the Western Hemisphere, including $105 millions for exploration. The company, according to R. G. Follis, chairman of the board, spent $281 millions last year and showed an income of $7.04 per share.

SANTA FE, N.M.—The New Mexico Oil Conservation Commission has set the state's April allowable at 264,836 bbl. daily, including 10,000 bbl. supplemental. This figures out to 41 bbl. daily per unit, the same as for March and February. However, the total is an increase of 4,500 bbl. over March.

WHITING, Ind.—Standard Oil Co. (Ind.) has let prime contract to C. F. Braun & Co. for construction of a 55,000-bbl. crude-distillation unit at its refinery here. Initial operation of the unit is scheduled for January 1956. Several batteries of stills which have not been operated in recent years have been dismantled to clear a site for the new unit.

SAN FRANCISCO.—Tide Water Associated Oil Co. is proceeding with engineering studies for coking facilities at its Avon refinery near here. The 42,000-bbl. fluid unit being considered would be one of the largest coking installations on the West Coast.

West Coast Imports Soar

Reports to Railroad Commission indicate jump of 42.8 per cent in volume of crude coming through western ports

AUSTIN.—Crude imports on the West Coast are expected to climb at a faster rate in the first 7 months of this year than either crude or product imports in the East.

Crude imported on the West Coast by companies reporting to the Texas Railroad Commission averaged 47,700 bbl. daily in the January-July period of 1954. According to the latest reports filed with the commission, West Coast crude imports will rise to 68,100 bbl. daily for the first 7 months of this year. This represents a gain of 42.8 per cent.

Crude coming into Gulf and East Coast ports averaged 587,900 bbl. daily in the first 7 months last year, according to company reports to the commission. Actual crude imports into these two areas for last January and February, combined with company forecasts for the next 5 months, will average 656,300 bbl. daily for an increase of 11.6 per cent over the same period of 1954.

Comparisons with actual crude imports listed by the Bureau of Mines or the Census Bureau indicate that most of the imported crude is accounted for by the reports to the Texas Railroad Commission.

Product imports rising . . . Company reports to the commission do not cover all product imports, but the part covered by the reports shows a gain from 338,000 bbl. daily for the first 7 months of 1954 to 381,000 bbl. daily projected for the corresponding period this year. The gain is 12.7 per cent.

Individual company estimates for the March-July period are compared with actual data for February and with the average for the year 1954 in the large table. In some cases the current data reported were preliminary, so the average for the year may vary slightly from actual imports for some companies.

Imports of heavy fuel drop sharply during the summer months. The gradual decline in product imports from 519,000 bbl. daily in February to 269,300 bbl. daily in July is a normal seasonal trend.

Crude production is expected to increase about 5 per cent in 1955. If the 1954 ratio of crude imports to crude production is to be retained in 1955, the import average for the year can not exceed 680,000 bbl. daily. Forecasts for all months through July are above that average.

The rate of increase for product imports also exceeds the expected percentage gain in domestic crude production, according to data from company reports.

Estimates lowered . . . At the February allowable hearing before the Texas Railroad Commission, importing companies predicted total imports for the first quarter would average 1,240,200 bbl. daily. Second quarter imports were forecast at 1,071,600 bbl. daily.

Company estimates at the March hearing show a reduction of 12,600 bbl. daily for the first quarter to 1,227,600 bbl. daily. Second-quarter estimates were trimmed 48,200 bbl. daily to 1,023,400 bbl. daily.

Despite these reductions, first quarter imports will be 17.8 per cent greater than for the first quarter of 1954. Imports for the second quarter will be up 11.3 per cent. However, the gains will vary by areas and by commodities.

CRUDE AND PRODUCT IMPORTS*

(Thousands of barrels daily)

	1954 actual	1955 forecast	Per cent change
January	1,051.3	‡1,224.9	16.5
February	1,091.7	‡1,266.3	16.0
March	989.3	1,195.3	20.8
First quarter	1,042.5	1,227.6	17.8
April	872.8	1,023.2	17.2
May	995.7	1,014.5	1.9
June	886.3	1,032.8	16.5
Second quarter	919.1	1,023.4	11.3
July	933.7	991.7	6.2

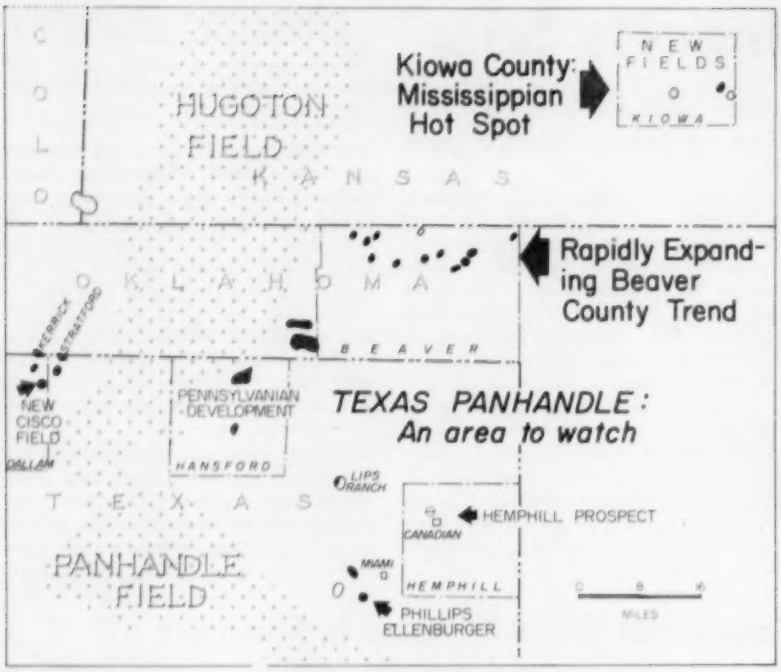
*From company reports to the Texas Railroad Commission. †Actual.

Seasonal Drop in Total Is Forecast

(Thousands of barrels daily)

	Actual*		Estimated or forecast*				
	Year 1954	Feb. 1955	Mar. 1955	Apr. 1955	May 1955	June 1955	July 1955
CRUDE-EAST COAST:							
Atlantic Refining Co.	62.7	65.8	62.0	62.0	62.0	62.0	62.0
Cities Service Co.	11.3	11.6	39.3	29.7	19.3	47.3	25.8
Eastern States Petroleum Co.	4.3	7.3	8.8	11.8	15.8	15.8	15.8
Gulf Oil Corp.	118.1	159.0	131.0	117.0	117.0	117.0	117.0
McBride Oil & Gas Corp.	†1.5	3.9	3.2	3.3	6.5	6.6	6.4
Phillips Petroleum Co.	7.0	14.2	9.7	10.0	9.7	10.0	9.7
Sinclair Oil Corp.	65.2	52.2	66.0	66.0	66.0	66.0	66.0
Socony-Vacuum Oil Co.	87.2	73.6	85.0	80.0	80.0	80.0	72.0
Southwestern Oil & Refining Co.	†1.6	4.1	6.8	3.7	3.6	(‖)	(‖)
Standard Oil Co. of California	70.7	98.3	72.3	72.3	72.3	72.3	72.3
Standard Oil Co. (Ind.)	15.3	15.2	12.9	13.6	16.4	16.8	16.3
Standard Oil Co. (N. J.)‡	80.7	77.0	79.0	79.0	79.0	79.0	79.0
Sun Oil Co.	15.1	28.8	13.2	7.5	17.3	27.5	27.3
The Texas Co.	52.3	65.9	62.0	63.0	68.8	68.5	66.4
Tide Water Associated Oil Co.	†5.1	9.6	10.8	11.2	10.8	4.0	10.8
Total East Coast	598.1	686.5	662.0	630.1	644.5	672.8	646.8
CRUDE-WEST COAST:							
Socony-Vacuum Oil Co.	†3.6	22.3	27.1	27.0	27.0	27.0	27.0
Standard Oil Co. of California	21.0	17.1	15.7	15.7	15.7	15.7	15.7
The Texas Co.	10.6	6.1	11.8		7.4		7.4
Tide Water Associated Oil Co.	13.7	15.3	13.5	28.8	27.6	16.7	25.5
Total West Coast	48.9	60.8	68.1	71.5	77.7	59.4	75.6
Total crude	647.0	747.3	730.1	701.6	722.2	732.2	722.4
PRODUCTS:							
Asiatic Petroleum Co.	4.7	4.1	8.2	5.0	7.0	8.0	7.5
Cities Service Co.		2.5					
Eastern States Petroleum Co.	18.4	16.0	17.3	17.3	17.3	17.3	17.3
Gulf Oil Corp.	6.5	4.0	4.0	4.0	4.0	4.0	4.0
Shell Caribbean Petroleum Co.§	111.3	171.0	150.0	95.0	70.0	80.0	70.0
Shell Oil Co.	18.3	30.4	20.2	21.9	17.8	18.4	17.8
Sinclair Oil Corp.	†1.2	2.3					
Socony-Vacuum Oil Co.	7.6	7.0	7.6	7.6	7.6	7.6	7.6
Standard Oil Co. (Ind.)¶	†14.8	18.7	15.9	18.8	16.6	13.3	9.7
Standard Oil Co. (N.J.)‡	153.0	263.0	242.0	152.0	152.0	152.0	132.0
The Texas Co.	†2.5						3.4
Total products	338.3	519.0	465.2	321.6	292.3	300.6	269.3
Total crude and products	985.3	1,266.3	1,195.3	1,023.2	1,014.5	1,032.8	991.7
Bonded fuel included**	62.1	72.9	70.9	70.9	72.8	73.9	74.3

*From company reports to the Texas Railroad Commission. †Reported imports for only part of year. ‡Based on quarterly estimates. §Imported by independent distributors. ¶Received through suppliers who can furnish either domestic or foreign oil. ‖Unable to forecast. **Mostly duty free for bunkering ships in foreign trade.



Hugoton embayment play makes . . .

. . . Tri-State Hot Spot

John C. McCaslin

TULSA.—Widespread discoveries and hints of more strikes to come are making the Hugoton embayment of the western Anadarko basin one of the country's leading exploratory provinces.

The tri-state Hugoton area—southwestern Kansas and the Oklahoma and Texas Panhandles—is ending the first 1955 quarter with unprecedented success following its biggest year in history in 1954.

Interest is centering in three areas.

. . . **Kiowa County** holds the focal point of Kansas wildcat interest in the northeastern part of the Hugoton province. Recent Mississippian gas and oil discoveries there have brought some dusty maps out of hiding.

. . . **Oklahoma's Beaver County** is the busiest area of the whole embayment. A 60-mile trend of Mississippian-Chester and Pennsylvanian discoveries is rapidly growing into a major gas and gas condensate producing region. This county-wide success is centered at Mocane.

. . . **The Texas Panhandle's** first Ellenburger producer has the industry keeping close watch over developments. First oil production for Hemphill County is in prospect at a wildcat near the town of Canadian. Dallam County has its second gas producing area, attracting further interest to this far northwestern Texas county. Pennsylvanian gas and oil development continues unabated in prolific Hansford County.

Kiowa County in southwestern Kansas seems destined to become a major Mississippian producing area for the Hugoton province. Three completed discoveries and one new indicated success have put this county in a commanding position over other Kansas activity.

The latest indicated success for Kiowa is GMR Oil Corp.'s 1 Piester, 7½ miles south of Wellsford. The operator is taking drill-stem tests in the Mississippian with gas production assured. Two miles northwest of this well is the only oil discovery in the area, Pyle field. Falcon Seaboard and Gulf Oil Corp. opened this field recently at 1 Pyle with a pump potential of 304 bbl. of oil per day from the Mississippian. The same operators in February opened a gas field 13½ miles west. An outpost well was announced last week.

The Falcon Seaboard-Gulf Oil Corp. discoveries were drilled on a 10,000-acre block on which the companies plan seven wildcats. The first two drilled were discoveries.

Busy Beaver . . . The exploratory and development fever has hit Beaver County in the eastern Oklahoma Panhandle in a big way. Since late last year more than a dozen new fields and extensions have made this county the second-busiest in Oklahoma.

Lion Oil Co. is completing the first "outside Hugoton field" Permian producer in the region at 1 Hodges, 5 miles northeast of Forgan, Oklahoma.

The company will dually complete from Toronto-Pennsylvanian and Council Grove-Permian. This moves production more than 30 miles east of Hugoton field-Permian gas production. After acid treatment, the strike flowed 2,700 M.c.f. of gas per day from the Permian plus production from the Toronto.

An important link-up well between Southeast Mocane and Northwest Knowles field has been completed by Pure Oil Co.

The 2 May Dixon, 2 miles northeast of Mocane field in the highly-active Mocane district (100 square miles), flowed 6,500 M.c.f. of gas per day from the Morrow sand. Another well in the Southeast Mocane field has assured that field's second pay—the Mississippian.

The Ellenburger discovery area in northern Gray County in the Texas Panhandle received a new location last week. It is Phillips Petroleum Co. 1-B Troy, 8 miles south of Miami and ½ mile southeast of the 1-A Troy, recently-completed first Ellenburger producer in the Panhandle. The Ellenburger play will continue to receive considerable attention in this deep western Anadarko basin region.

New Cisco pool . . . It's number two for Dallam County in far northwest Texas. That area received its second gas producing area last week at Shamrock Oil & Gas Corp. 1 Foxworth Skaer et al, 7½ miles northwest of Stratford. The discovery well flowed gas from the Cisco-Upper Pennsylvanian. It is located about 5 miles southwest of Stratford field, a 1954 Cisco gas discovery area, and is 5½ miles southeast of the county's first producing area, Kerrick field, also opened in 1954.

Hemphill due oil . . . This eastern Texas Panhandle county has its first oil production in prospect at Sun Oil Co. 1 Dale Nix, 2½ miles northwest of Canadian.

The important well swabbed at the rate of 3½ bbl. of oil on a 3¼-hour test of the Des Moines-Pennsylvanian. Nearest production to the remote test is at Lips Ranch field, 23 miles northwest in Roberts County.

Hansford's success unlimited . . . This northern Panhandle county has added many new rigs to its success ladder since the big discoveries of last year.

The latest discovery is a new Morrow gas field in the north-central part of the county. The well, Sharples Oil Corp. 1 Ralston, 5 miles northwest of Gruver-Penn field, flowed 12,500 M.c.f. of gas per day.

A Tonkawa discovery has been shut in by Sharples at 1 Boyd, 12 miles northwest of Spearman, after flowing 15,000 M.c.f. daily. This production was confirmed at a 1-mile west outpost, the 1 Beck. Two new locations have been staked to further evaluate the Tonkawa's potentialities. Another formation being actively developed is the Cherokee. A prolific Tonkawa discovery north of Twin Morrow field has been assured outstanding production. The well, Producers Chemical Service, Inc. 56-1 Steele, flowed 25 to 30,000 M.c.f. of gas per day after acidization.

Units Paying Off

A.P.I. told 3½ billion barrels to be recovered

AMARILLO.—Present unit operations in the United States will recover nearly 3½ billion barrels more oil than would have been produced otherwise.

This figure was revealed here last week in a report to the secondary-recovery committee of the American Petroleum Institute Mid-Continent production meeting.

A preliminary report on a study being made for the Interstate Oil Compact Commission was presented by A. E. Sweeney, Jr., of the Compact staff.

The report showed that there are 278 fully unitized reservoir-wide unit projects in 16 states, with a total 1954 production of 208,427,588 bbl.

Before unitization these fields would have produced 5,217,181,000 bbl. or 27.5 per cent of the original oil in place. As a result of unit operation it is now estimated that they will recover a total of 8,637,164,000 bbl. or 46.3 per cent of oil in place.

The discussion also showed that unit operation of about 9 per cent of the industry's production has increased the nation's total reserves about 10 per cent.

The survey also disclosed 31 unit operations covering less than an entire reservoir, and it was estimated that the 309 units have a total reserve of close to 6 billion barrels of recoverable liquid hydrocarbons.

Use of Unifining Spreads

NEW YORK.—The Unifining process for hydrogen treating distillate fractions is being added at a number of refineries across the country.

New Unifiners include two 22,200-bbl. units for the El Segundo and Richmond, Calif., refineries of Standard Oil Co. of California; a 7,000-bbl. unit for Eastern States Petroleum Co., Inc., at Houston; and a 1,500-bbl. unit for Elk Refining Co. at Falling Rock, W. Va.

Platformers and Unifiners, both licensed by Universal Oil Products Co., are to be built at Frontier Refining Co.'s Cheyenne, Wyo., refinery, and Pennzoil Co. is considering units at Rouseville, Pa.

Imports, Exports Dip

January figures for both show drop from December

BOTH imports and exports were slightly lower in January than in December.

Total imports averaged 1,300,000 bbl. daily in January compared with 1,322,000 bbl. daily in December. Exports in January were down to 283,000 bbl. daily from 292,000 bbl. daily in December.

On the other hand, imports were up 260,000 bbl. daily from a year ago while total exports remained unchanged.

For imports, the decline in January was due to a reduction in crude receipts, but most of the gain over January 1954 can be credited to gains by products.

Crude imports dropped 73,000 bbl. daily between December and January but part of this reduction was offset by the gain of 51,000 bbl. daily for products.

Compared with January 1954, crude imports gained 88,000 bbl. daily and products increased 172,000 bbl. daily.

In the accompanying table total crude from Venezuela includes 127,000 bbl. which was credited to Netherlands Antilles by the Census Bureau. Since no crude is produced in Caribbean islands, Venezuela is the most logical source of the crude.

Total exports decreased 9,000 bbl. daily with losses for crude, gasoline, lube oils, and other products partly offset by a big increase in exports of residual fuel. Resid exports gained 32,000 bbl. daily.

Import-export data are compiled by the Census Bureau of the Department of Commerce.

IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	Jan. 1955	Dec. 1954	Jan. 1954
Crude—			
Mexico	635	596	373
Colombia	721	713	1,282
Venezuela	10,600	11,993	9,596
Peru	121		
Trinidad		130	
Ecuador		100	
Kuwait	4,604	4,444	3,125
Saudi Arabia	1,976	2,214	1,946
Neutral Zone	577	189	
Iraq		119	202
Iran		208	
Qatar	419	216	178
Canada	527	645	232
Far East	619	1,499	1,138
Total crude	20,799	23,066	18,072
Daily average	671	744	583
Products—			
Residual fuel	17,773	16,324	13,369
Other products	1,730	1,596	797
Total products	19,503	17,920	14,166
Daily average	629	578	457
Total all oils	40,302	40,986	32,238
Daily average	1,300	1,322	1,040

EXPORTS*

	Jan. 1955	Dec. 1954†	Jan. 1954
Crude	381	797	1,587
Gasoline	1,980	2,236	2,074
Kerosine	109	95	418
Distillate fuel	1,755	1,849	1,616
Residual fuel	2,819	1,830	1,352
Lube oils	900	1,302	875
Other products	830	955	877
Total all oils	8,774	9,064	8,799
Daily average	283	292	284

*Excludes shipments to territories. †Revised.

Super-Inch Jobs Signed

HOUSTON.—Seven contractors have been picked by Transcontinental Gas Pipe Line Co. to handle a $83-million looping project. Six of the contracts cover 36-in. pipe.

The project will be the first big use of 36-in. pipe, with 315 miles of the super-inch pipe included in the looping (*The Oil and Gas Journal, March 14, page 86*). The program also includes 219 miles of 30-in. pipe. Work will start in April and be completed this fall.

The contractors, size of pipe they will lay, and locations of the spreads follow:

O. R. Burden Construction Corp., 5.31 miles of 36 in. and 25.4 miles of 30 in. in Louisiana; Associated Pipe Line Contractors, Inc., 63.5 miles of 36 in. in Louisiana and Mississippi and 71 miles of 30 in. in Virginia and Maryland; Midwestern Constructors, Inc., 14.45 miles of 30 in. and 53.55 miles of 36 in. in Alabama; Houston Contracting-H. C. Price, 84.8 miles of 36 in. in Alabama and Georgia; Western Pipe Line Contractors, 76.8 miles of 36 in. in Georgia and South Carolina; Panama-Williams Co., 36 miles of 30 in. and 31.4 miles of 36 in. in South Carolina and North Carolina; and Williams Brothers Co., 72.2 miles of 30 in. in Virginia.

FPC Endorses Bill

Four agency members favor removing gas producers from federal control, say Harris measure will solve problem

WASHINGTON.—Four of five members of the Federal Power Commission favor the Harris bill exempting independent natural-gas producers and gatherers from federal regulation.

FPC Chairman Jerome K. Kuykendall gave that information to the House interstate commerce committee last week and added:

. . . Congress never intended federal regulation of independent natural-gas producers.

. . . The FPC does not want the job of regulating them.

. . . The Harris bill will solve the problems raised by the Supreme Court decision in the Phillips case.

Kuykendall was the first witness before the committee in hearings which will not wind up before the end of April. He gave unqualified support to the Harris bill—for himself and fellow commissioners Smith, Digby, and Stueck. Only Commissioner Draper refused to sign a report sent the committee. Draper believes producers should be regulated as well as interstate pipelines.

Host of bills . . . The committee has before it 25 bills dealing with natural gas. Some follow the line of the Harris bill. Others would affirm the Phillips decision. Still others would force the FPC to allow only original cost of producing properties in fixing pipeline rates. The commission last year scrapped that base in favor of fair field price for pipeline-produced gas.

Kuykendall said:

"It is the considered opinion of the majority of this commission that legislation should be enacted which will exempt from the operations of the Natural Gas Act independent producers and gatherers of natural gas who sell gas at wholesale to pipeline companies, but who do not themselves engage in the interstate transportation or subsequent sale of such gas."

Kuykendall declared the FPC was closely associated with the events which led to enactment of the Natural Gas Act. It feels itself "peculiarly able" to interpret that Congress intended to bar the commission from any control over production and gathering "including sales of gas made as an incident" to such operations.

The FPC, after the Phillips case decision, was named in many suits filed to test the rules set up for producer filings. The commission will be involved in legal proceedings for many years. And there are many detailed problems with which the FPC has not yet come to grips, he said.

The Harris bill will solve those problems. And in the long run, Kuykendall said, it will "result in the greatest good to the largest number of people."

No reason for control . . . Kuykendall said the production of crude oil and its products, including natural gas, is essentially a mining operation. So is the production of coal. There is no reason why natural gas should be regulated while leaving coal or oil completely free. If regulation fixes the price of natural gas below that of other fuels, gas will inevitably drive others out of the markets. Gas should not be the only fuel over which an artificial ceiling is placed.

Kuykendall added, "we have heard no demand that the oil production industry should be regulated as a public utility, and do not understand why natural-gas production should be so regulated, and oil production should remain unregulated."

The commission pointed out that fear of regulation has led many producers, especially oil companies, to withhold gas from interstate markets. Under the Harris bill, he said, large amounts of gas would be released. The additional supply would be a restraint on price and prevent the danger of exhorbitant rates.

The bill also would permit contracts which would give producers reasonable adjustments in prices over a period of time sufficient to justify the cost of a pipeline. Without long term contracts pipelines could not be financed on favorable terms. The FPC would not feel it could authorize their construction. But without some assurance against regulation, Kuykendall said, many producers will not be willing to enter into long term contracts.

Kuykendall told the committee that in 1940 eight major pipelines produced more than 47 per cent of the gas they handled. In 1952 only 18½ per cent of their needs was produced by 15 major systems. The FPC sought last year to reverse this trend by granting fair field price for pipeline-produced gas. The Harris bill supports that action.

Ernest O. Thompson, Texas railroad commissioner, warned the committee federal control of gas at the wellhead also means federal control of oil. He said oil and gas may be produced together and added: "It is inconceivable how we can have federal control of gas at the well and not at the same time have control of oil, which is produced simultaneously and as an integral part with the gas."

Thompson declared if the Harris bill is not passed the search for oil and gas will be reduced and the interstate marketing of gas by men who are primarily oil producers will slow down. The supply of gas will shrink and prices will go up, he added.

Surplus Forecast

Interior Department may become self-supporting

WASHINGTON.—The Interior Department will collect more money than it will spend in fiscal 1956.

Oil and gas leasing, mineral development, grazing, and other money-making activities of the department will bring in an estimated $315,000,000 in the year beginning July 1. A bill in Congress, already passed by the House, would allow the department $298,000,000 for expenses.

Some of the money collected will be distributed to the states, but more than $180,000,000 will go to the federal treasury. Sec. Douglas McKay told an appropriations subcommittee he looks forward to the time when the department will be self-supporting.

To cut departmental costs below $300,000,000, the House appropriations committee lopped $15,000,000 off the budget estimates submitted by President Eisenhower.

Petroleum branches . . . The oil and gas activities of the department will get about the same money as this year. The Oil and Gas Division is to get $250,000, with $140,000 additional for enforcement of the Connally Hot Oil Act. The Bureau of Land Management will get an increase of $1,137,000, but most of it will be for the soil and moisture programs with a small sum for land leasing and disposal work.

The Geological Survey also will get a small increase, $200,000 of which is to finance plans for a new building in Washington.

The Bureau of Mines funds for oil and gas research will be practically unchanged. The committee cut out $607,000 which will be saved by closing the oil-shale plant at Rifle, Colo., but allowed $425,000 for coal-to-gas research and $125,000 for operation of the new Morgantown, W. Va., laboratory.

Rubber Sales Near

Congress votes transfer to private ownership

WASHINGTON.—A privately owned American synthetic-rubber industry will emerge within a month. Congress cleared the way last week for transfer of government-owned plants to private hands. The disposal commission now hopes to complete the deal before the end of April.

Congressional action on sale of the plants reached a climax last week. The House turned down two moves to stop sales approved by the commission. The Senate followed suit.

One move was aimed at the whole program and would have left the plants under government ownership. The other opposed a "package" deal allowing Shell Chemical Corp. to buy three California plants.

As a private enterprise, the industry will start with 8 petroleum and 1 alcohol butadiene plants, 1 stryene, and 1 dodecyl mercaptan (DDM) plant, and 11 GR-S and 2 butyl plants turning out finished rubber.

Buyers will pay $285,465,000 for the plants, $300,000 for miscellaneous equipment, $24,000,000 for inventories. Total cost will be $310,765,000. Plants and equipment originally cost $488,584,000 but the commission has estimated present depreciated value at $131,954,000.

Dulles Opposes Curbs

WASHINGTON.—Secretary of State John Foster Dulles says "good progress" is being made toward voluntary control of foreign oil imports and formal import curbs should not be imposed.

The cabinet member was the final witness before the Senate finance committee studying tariff laws. He declared oil quotas would injure relations with Latin America, especially in Venezuela where a climate attractive to foreign investment has been created.

Dulles said he knows imports could damage the domestic oil industry but explained the answer is to make foreign producers and importers realize they can flood the market and bring drastic action.

WATCHING WASHINGTON

Bertram F. Linz

Many Bills Await Action

Most of the oil and gas bills Congress will deal with this year have now been written.

There are nearly 60 bills before committees. More than a dozen of them are on imports and tariffs. Another 20 are proposed amendments to the Natural Gas Act.

The Senate finance committee is nearly through with its study of extending the Reciprocal Trade Act. The House interstate commerce committee opened hearings on the exemption of independent producers from FPC regulation last week. Congress took final action on sale of the Government's rubber plants.

This leaves only about 10 other oil and gas subjects on which Congress may act. Some of them probably won't come up. A bill to provide emergency allocations and priorities is one. Transfer to the states of the mineral rights on the public lands is another. Return of the outer Continental Shelf to the federal Government is a third.

Extension of the Interstate Oil Compact is definitely listed for action. A strong try will be made to get action on bills to continue the shale-oil plant at Rifle, Colo., and to earmark revenues from the Continental Shelf for aid to education.

Other bills would require competitive bidding on oil and gas leases outside of known structures, revise the Interstate Compact Act, and open to mineral leasing Government lands reserved for power development. Some bills deal with anti-trust matters.

Oil's Help Sought

A group of barge operators is trying to get the oil industry into what started out as a private fight.

The fight is over a bill in Congress which would give the Interstate Commerce Commisison regulatory rights over carriers of dry bulk cargoes such as coal, grain, sand, and fertilizers. Such cargoes are now exempt from federal control under a 1940 law. Packaged cargoes, such as oil in drums, are under ICC regulation.

On the face of it, oil wouldn't be affected by the bill. But the group fighting it is asking for the support of the oil industry. Once dry bulk cargoes were under regulation, they say, extension of control to liquid bulk commodities might follow quickly.

Federal control would seriously affect companies which have located plants at waterside to take advantage of low-cost, inland-waterway and river transportation. The bill would not apply to shipping on the Great Lakes or coastwise.

The carriers believe they would lose much business under ICC regulation.

Government in Business

The synthetic-rubber industry is big, but it is one of the smaller of the Government's industrial operations.

Sale of the Mississippi River barge line in 1953 and the disposition of the rubber plants have fixed much attention on the business adventures of the Government. Some interesting facts have been dredged up by people who have been digging into this.

The Government, for instance, is both the nation's biggest electric-power producer and the biggest power consumer. It is the biggest banker, biggest employer, biggest insurance company, biggest landlord, biggest tenant, and biggest publisher.

The Government owns more wheat than all the wheat farmers. More grass land than all the cattlemen. More trucks than General Motors. And, of course, more oil land, upland and submerged, than the oil industry.

Nobody has ever been able to find out everything the Government does. Not even the Government itself has a complete master list of all its businesses and industries. But its corporation and business activities run to more than $55 billion.

Some of the Government's activities just happened. Development of the public lands, for instance. It got into others in the depression, when it started lending money on anything from barber's chairs to railroads. Others were started in wartime, like the synthetic-rubber industry.

L.P.G. Flooding Tested in Texas

- Three floods planned or under way as operators look for higher recovery
- Shamrock conducted only successful flood, but it was accidental

Robert J. Enright

DALLAS.—As long as operators have to go off and leave depleted pools with large volumes of oil still down there, they'll keep trying new methods to get more out.

These efforts are being stepped up as new oil fields become harder and more costly to find.

What can be done to produce more of the oil remaining in a reservoir when conventional recovery methods won't work or when they have reached the economic limit? A growing number of operators think L.P.G. injection may be the answer in many cases.

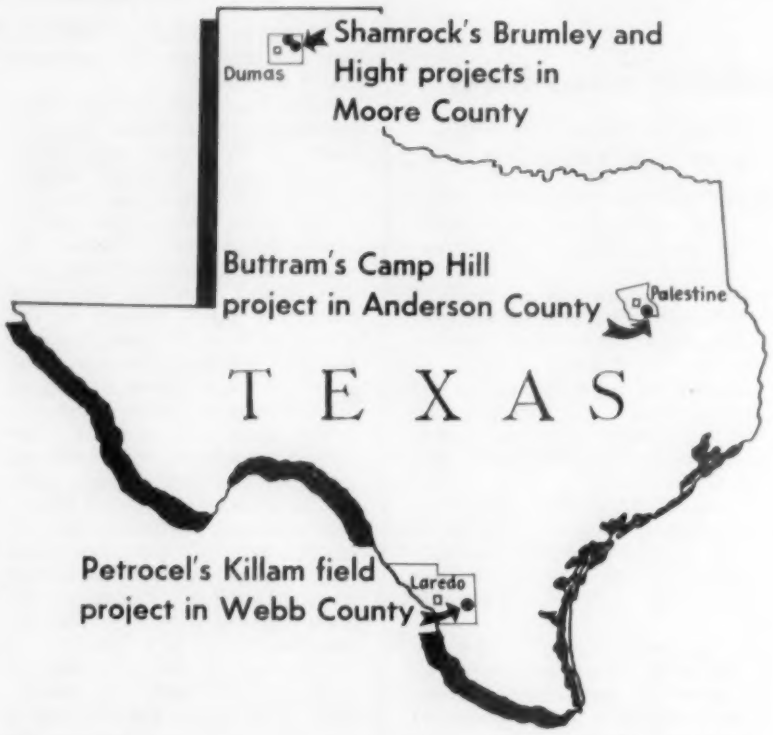
So far, complete data are available on only one project in which L.P.G. injection hiked recovery from an oil field. This project, so far as it concerned increasing oil production, was a gratifying accident.

In the past few months, however, at least three L.P.G. - injection projects have been announced—all by relatively small operators. The bigger companies aren't overlooking any bets, but they're not making any noise about it. It is known, for instance, that Carter Oil Co. and Stanolind Oil & Gas Co. have been conducting field tests of the possibilities of L.P.G. floods.

What it does . . . So far as can be determined, all projects either started or planned so far will use butane or propane or both as the injection fluid.

These are hydrocarbons and are miscible in crude oil. Therein lies the key. The L.P.G., unlike water, can simply dissolve the oil out of the reservoir rock. Along with this, L. P. G. has water's desirable liquid characteristic.

Theoretically, L.P.G. could flush 100 per cent of the oil out of a reservoir if physical properties of the pool were ideal. In probably 100 out of 100 cases they aren't. Oil scientists believe, however, that L.P.G. probably would sweep a larger area of a given reservoir than water and certainly would recover a far greater portion of oil.



Injection pressure in most cases where L.P.G.-injection might be considered would be no problem. At about room temperature, say 70° F., pressures of about 123 and 31 psi. are required to keep propane and butane, respectively, in the liquid state.

As the temperature goes up, more pressure is required. At 100° F., the vapor pressures of propane and butane are about 184 and 50 psi., at 200° F., about 370 200 psi.

Earth temperatures increase with depth roughly about 1° F. each 70 ft. In West Texas they go up faster than this, and faster still on the Gulf Coast. Using this yardstick, however, butane could be kept in the liquid state in a 4,000-ft. well by maintaining a bottomhole pressure of about 60 psi.—and in a 17,000-ft. well with a pressure of between 400 and 500 psi.

Probably the biggest drawback to L.P.G. flooding and no doubt a strong reason for its slow adoption by the industry is the high cost of the injection fluid. Cost figures resulting from studies of L.P.G. floods so far aren't being made public.

They are believed sufficiently high, however, to warrant careful engineering studies to weigh costs of an L.P.G. flood and its probable recovery against cost and probable recovery of say a water flood.

In view of this cost factor, it is doubtful that any large L.P.G. floods will be undertaken soon. The technique looks much more attractive right now to smaller operators with low-pressure, low-gravity production and to those who might be able to operate such a flood along with an L.P.G. - storage project.

The first one . . . It was such a case—the accident mentioned earlier — that apparently sold Shamrock Oil & Gas Corp. on L.P.G. flooding.

Shamrock began storing L.P.G. May 30, 1952, in a nearly depleted limestone oil pay at 3,440-50 ft. under its Brumley lease in the West Panhandle field of the Texas Panhandle. The L.P.G. came from the big Shamrock-operated Moore County gasoline plant close by.

The Brumley reservoir is a stratigraphic trap, producing under solution-gas drive. Productive area of the pool is about 320 acres.

There were three wells on the lease

producing 53 bbl. of 38°-gravity oil daily when L.P.G.-storage injection was started through a single input well. Reservoir pressure was about 200 psi.

Three months later oil production from the three old wells began to shoot upward. During the first 8 months of 1952, lease production totaled 10,721 bbl. During the last 4 months, it nearly doubled this figure to 18,131 bbl. Production of casing-head gas, meanwhile, fell from 50,063 M.c.f. during the first 8 months to 18,943 M.c.f. the rest of the year.

Shamrock was injecting an average of about 100 bbl. of L.P.G. daily at 500-600 psi. at the start of the project, but the injection rate fluctuated rather widely with the market for products from the gasoline plant.

Production climbed sharply for about 11 months then began to drop off rapidly. The lease produced 28,823 bbl. of oil and 86,509 M.c.f. of gas in 1953. Two more producers were drilled in 1953 to provide more effective oil recovery.

Shamrock engineers believe portions of the reservoir were completely flushed and that the company produced a considerable volume of oil that would not have been produced without the L.P.G. injection.

All told, Shamrock injected 655,061 bbl. of L.P.G. during this period—213,354 bbl. in 1952 and 441,707 bbl. in 1953. From start of injection to the first of 1954, the company produced 48,148 bbl. of oil. It attributes 32,000 bbl., or 67 per cent, directly to L.P.G. injection.

It isn't known whether recovery might have been increased more if a more constant rate of L.P.G. injection had been maintained.

To try again . . . Shamrock apparently was impressed by its discovery. It has just obtained a permit from the Texas Railroad Commission to launch a similar L.P.G. storage and repressuring project under its Hight lease, also in West Panhandle field.

The so-called Brumley and Hight leases are actually pools but are listed along with a large number of similar reservoirs as West Panhandle field. The two reservoirs are about 7 miles southwest from nearest oil production.

Shamrock intends to inject the L.P.G. through five converted producers into shallow lime oil pay at plus 126-209 ft. The Hight project probably will give the company more specific data on the L.P.G. injection process. Both butane and propane have been going into the Brumley pay. When Hight injection facilities are ready, one product will be used exclusively in this project, the other as the sole injection fluid in the Brumley flood.

The Hight lease produced about 180,000 bbl. of oil from its discovery in June 1939 to the first of 1955. At a recent Railroad Commission hearing on the Hight flood, E. T. Rogers, chief engineer for Shamrock, cited successful operation of the Brumley project and said L.P.G. injection there has increased viscosity of the dead oil in the reservoir and brought the crude to the surface.

South Texas venture . . . While Shamrock prepares for its Hight project, Petrocel Corp. in the opposite end of the state in Webb County is getting ready to do the same thing in Killam field.

The company, which owns all working interest in the 457-acre field, is going forward with a unitization and pressure-maintenance program to hike recovery from the "A" sand, a Mirando sand producing low-gravity crude.

Petrocel will inject propane in a combined repressuring and storage operation. Initially the company will give the reservoir a test shot of 100,000 gal. and evaluate the results before going further. Petrocel engineers estimate that primary producing methods will recover only 21 per cent of the oil in place originally. They believe the company can produce 75 per cent of the remaining 79 per cent of the oil via propane injection. Petrocel's reasoning is the same as the others'—that the propane will dilute the low-gravity crude and increase the reservoir volume factor and pressure.

Camp Hill setback . . . Oklahoma City operator Frank Buttram is having his troubles in still another L.P.G.-injection operation started last fall in the 660-acre Camp Hill field southeast of Palestine, Tex., in Anderson County.

This was the first, and so far only publicly announced L.P.G.-injection project designed solely to increase oil recovery from a field. It has no storage aspects *(The Oil and Gas Journal, November 8, 1954, page 129)*.

Camp Hill field's 525-ft. Carizo-Wilcox pay is estimated by Buttram to contain 1,900 bbl. of oil per acre-foot. It has no commercial production, however, due to low reservoir pressure (about 70 psi.), highly viscous crude (34 cp.), and an unconsolidated pay sand.

The Oklahoman, with the permission of the Railroad Commission, used a five-spot, 10-acre pilot. He converted two existing wells to injection service, and drilled the remaining two inputs, the center producing well, and a water-supply well.

He estimated that by flooding with L.P.G. and then water he could produce roughly 9,000 bbl. of oil per acre using a new venturi-jet pump to whip the loose unconsolidated pay sand.

Buttram to date has injected 6,000 bbl. of an intended minimum amount of 10,000 bbl. of 70-30 butane-propane mix into the Carizo-Wilcox through the four input wells. He said last week, however, that he has not produced a drop of anything from the pilot producer.

He does not blame this phenomenon on any failure of the L.P.G.-injection technique, but on an oil string-cementing operation which he believes effectively cemented off the oil zone in the producing well.

The future of this L.P.G.-injection project isn't certain. Buttram has decided to abandon it temporarily in favor of a straight water flood in an identical five-spot, 10-acre pilot just to the east. The Oklahoman says what he learns from the water pilot will probably have a lot to do with whether he resumes L.P.G. injection.

If he does go back to the original pilot, he probably will recomplete the center producer by whipstocking to get away from the cement-packed area.

New Refinery Tax

Another plan proposed to Texas Legislature

AUSTIN.—A second bill proposing a 1-cent-a-gallon processing tax on combustible condensates made in Texas has been introduced in the legislature. Refiners and gasoline plant operators would pay the levy.

The bill is sponsored by Rep. J. C. Zbranek and is similar to a measure introduced earlier by Rep. Jerry Sadler. Zbranek's bill would provide a cut in the state gasoline sales tax from 4 to 3¾ cents a gallon to accompany the new levy. Sadler proposed to wipe out the sales tax.

Both measures are substitutes for a proposal by Gov. Allan Shivers that the gasoline sales tax be increased.

Sadler claims his processing levy would bring in $160,000,000 annually—$47,000,000 more than the present 4-cent gasoline sales tax.

Another tax . . . In other legislative actions, a subcommittee of the House revenue and taxation committee was to report late last week on a bill extending the state's chain-store tax law to include oil service stations. This would mean higher taxes for service stations operated by larger oil companies.

Prime backer of the bill is Texas Service Stations Associated, an organization dominated by smaller station operators.

Texas keeps output high with . . .

. . . Slight Allowable Cut

AUSTIN.—Texas oil men will have only a slightly lower crude-production allowable next month. The widely heralded "big April cutback" did not come off.

The Texas Railroad Commission at its state-wide hearing March 18 decided on 17 producing days for April, a 30-day month. This was the smallest possible change from the 18-day producing rate in 31-day March.

The result is a cut of only 39,500 bbl. daily from allowable production on March 5 and 4,189 bbl. daily less than the initial allowable figure for March.

The commission maintained Texas' high production rate—3,275,074 bbl. daily for April—despite wishes most purchasing companies expressed in their nominations. Nine firms favored a 16-day rate, cutting the allowable roughly 170,000 bbl. daily from March 5. These were Magnolia Petroleum Co., Humble Oil & Refining Co., Cities Service Oil Co., Phillips Petroleum Co., Continental Oil Co., Shell Oil Co., Sinclair Refining Co., The Texas Co., and Tide Water Associated Oil Co.

Sun Oil Co., Gulf Oil Corp., and Atlantic Refining Co. voted for 17 days. Stanolind Oil Purchasing Co. suggested only 15 days. Stanolind spokesman, Ralph Dietler, said he thought the industry should slow down and take stock of the record-smashing pace it has maintained since January.

Three factors apparently influenced the commission to keep Texas oil wells producing at a high rate:

. . . **The Bureau of Mines** estimated April demand at only 20,000 bbl. daily less than March.

. . . **Importing companies'** estimates of imports for the rest of the year have been reduced.

. . . **Domestic crude stocks** at the time of the hearing stood at 260,544,000 bbl.—considerably under the 266,200,000 bbl. which purchasing companies reported to the commission as ample.

Crane County cut . . . McElroy and Adamc fields in Crane County were taken off the state-wide schedule and placed on a 15-day basis due to flaring of about 3,000,000 cu. ft. of gas daily.

APRIL ALLOWABLES

District—	April	Change from March 5
1—Southwest	63,718	1,140
2—Gulf Coast	156,503	— 3,296
3—Gulf Coast	495,572	— 6,626
4—Southwest	271,459	— 5,400
5—East Central	52,050	— 1,029
6—Outside E. Texas	135,873	— 2,663
6—E. Texas field	235,337	— 4,750
7-B—W. Cent. Texas	188,779	— 1,579
7-C—W. Cent. Texas	226,516	— 3,088
8—West Texas	1,049,285	—13,092
9—North Texas	278,621	— 219
10—Panhandle	121,361	1,102
Total	3,275,074	—39,500

Drilexco Buys Crescent

DALLAS.—Drilling & Exploration Co., Dallas, has bought Crescent Drilling Co. of Monroe, La., for $1,300,000.

Drilexco acquired five heavy-duty diesel rigs and five steam rigs which have been operated in Louisiana, Mississippi, Arkansas, and East Texas. The company plans to extend its drilling operations to these areas. It also acquired all of Crescent's transportation equipment.

The new rigs boost Drilexco's total operating equipment in this country to 19. Three of these currently are running in West Texas, six in California.

WEST COAST

Test of New Drill Encouraging

LOS ANGELES.—Developers of the electrical rotary-percussion drill were quite satisfied with the performance of the tool when its first test was halted at a depth of 460 ft.

The next big step will be in a month or 6 weeks. Then a 9-in. tool is to start testing under oil-field conditions. The prototype tool will be approximately 8 ft. long as compared with the 15-ft. length of the 12¾-in. semi-commercial tool used at the recent Simi Valley test.

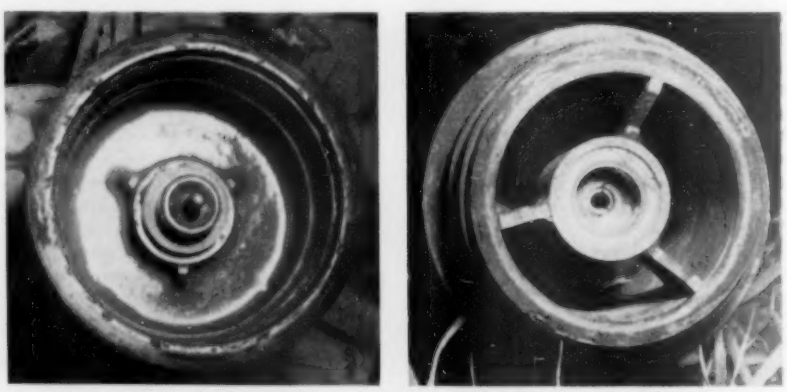
Despite some difficulties in the test, American Percussion Tool Co. engineers were pleased with the tool's initial operation. Drilling was halted because of insufficient generator capacity, they said. In place of the 40-kw. generator needed to supply the low-voltage power, a 15-kw. unit was used.

Before the tool was pulled for the last time, it had been in the hole continuously for more than 5 days. In drilling through granitic formations, it cut a 14¾-in. hole at rates as high as 35 ft. per hour. Bit weights of about 5,000 to 10,000 lb. were used, with rotating speeds of about 200 r.p.m. The solenoid-type percussion tool was placed just above the bit and below two drill collars *(The Oil and Gas Journal, March 14, page 81)*.

Power transmission . . . The system for conducting electrical power down the drill pipe functioned as expected. The conductor system loses about 17 v. per 1,000 ft. as compared with the approximately 90 v. loss in normal systems. Patents are being sought on both the drill and the conductor system.

As shown in the accompanying photographs, the high-pressure connectors are centralized by means of spiders. The box and pin-type couplings are silver-coated to help reduce voltage losses.

The cables and connectors are secured in each joint of drill pipe so



AN IMPORTANT FEATURE of the new rotary-percussion drill is the system used to keep voltage losses down the dri'l pipe at a minimum. The left picture shows the spider of a mud-filled joint of drill pipe in the hole. Shown at right is the spider of the box end of a joint ready to be run.

that they do not contact until about two turns have been made. In this manner they automatically make up with the addition of each joint to the drill string.

Presence of the cable and spiders in the drill string results in about a 19 psi. pressure drop per 1,000 ft. when mud circulation rates of 450 gal. per minute are being used.

Richfield Wins Suit

Court authorizes drilling from earth-filled islands

SACRAMENTO.—Richfield Oil Corp. got court clearance last week for plans to construct earth-filled islands from which to develop a state lease offshore from Rincon field in Ventura County, California.

The Third District Court of Appeals upheld the right of the State Lands Commission to permit drilling from the proposed man-made islands.

Ocean-front property owners have prevented Richfield from constructing the islands. Within hours after Richfield was awarded the 1,175-acre lease, the Sacramento Superior Court issued a writ nullifying the lease *(The Oil and Gas Journal, December 27, 1954, page 114)*.

Property owners contended the two islands which Richfield proposed would not be filled lands as defined in the Public Resources Code.

The Court of Appeals ruled unanimously, however, that "filled lands" from which drilling may be allowed need not be connected to the mainland.

The ruling is expected to be appealed to the State Supreme Court.

Under California law, the Lands Commission may grant offshore leases if evidence shows actual or threatened drainage of state tidelands from private wells. Drilling must be from upland locations, filled lands, or existing piers.

Richfield was awarded the offshore lease last December on basis of bids received 5 months earlier.

Wooden Derricks Outlawed

LONG BEACH, Calif. — The city council has ordered the Long Beach oil code amended to outlaw wooden derricks within the city limits and require removal of all such structures within the next 2 years.

Council members also ordered the city attorney to draw up an amendment prohibiting noise in oil zones adjacent to residential areas. Another amendment will provide for fencing sumps, pits, and storage basins as well as pumping equipment with exposed parts.

Offshore Contracts Amended

REDONDO BEACH, Calif.—Amendments to a proposed contract for drilling in the Redondo Beach tidelands have been approved by the City Council. Voters will pass on the final contract in a special election December 31.

The contract calls for a sliding scale of royalties with a $250,000 annual guarantee at the end of 5 years. A $200,000 cash bonus will be paid if voters permit drilling. Negotiations have been held with the Signal Oil & Gas Co., Reserve Oil & Gas Co., and the Artnell Co. The companies are interested mainly in the North Beach section where wells would be drilled offshore from jetties.

ROCKY MOUNTAIN

Drilling Company Sold

DENVER.—Great Basins Petroleum Co. of Denver has sold Mesa Drilling Co. and all its equipment to Southern California Petroleum Corp. of Los Angeles. The deal included five rigs.

C. G. Glasscock, Jr., Great Basins president, announces the sale involves issuance of Southern California Petroleum stock to Great Basins as well as cash. The sales will not be finalized until the stock transfer is approved by the California Corporation Commission.

Southern California Petroleum will join Great Basins in a working interest arrangement for exploratory work in the Rocky Mountain region. Camay Drilling Co., a Southern California Petroleum subsidiary, will operate Mesa's five rigs. Camay runs eight rigs in California and does drilling operations for International Egyptian Oil Co. in Egypt.

Field Ordered Shut In

DENVER.—The Colorado Oil and Gas Conservation Commission has ordered Leader field in Adams County shut in for 6 months.

The commission said the action was taken, with agreement of operators of wells producing from the J sand pool of the Dakota series, because gas flaring was threatening to lower reservoir pressure and reduce the quantity of oil that might ultimately be recovered.

The agency said a hearing will be held just prior to expiration of the order Sept. 8, to determine further action.

The commission also ordered a 40-acre spacing pattern for oil wells producing from the J sand of the Park field in Morgan County.

New Tax Proposal Studied

DENVER. — The Colorado Legislature is considering a third bill aimed at replacing the state's present severance tax on oil and natural gas.

The new measure provides for a graduated tax up to 5 per cent and an exemption from ad valorem taxes such as is contained in the present law. Introduced earlier were a measure calling for a flat 5 per cent severance tax on oil and gas and a constitutional amendment imposing a 3 per cent tax on production of irreplaceable natural resources.

Rep. Oakley Wade, author of the bill and chairman of the house finance committee, said the general assembly may be held in "technical" session until mid-July to permit the Colorado Supreme Court to rule on constitutionality of the newly proposed tax. The assembly is scheduled to adjourn by April 2.

Lease Controversy Revived

HELENA, Mont.—The U. S. Supreme Court's recent decision upholding Montana's indefinite-term oil and gas lease law has stirred up a new controversy over future leasing of state lands.

Gov. J. Hugo Aronson has called for immediate resumption of leasing, but Atty. Gen. Arnold H. Olsen claims the Supreme Court action did not "finally decide the fate" of the 1953 law. Olsen promised further steps in the litigation. In a public statement, Gov. Aronson said that "the attorney general should take politics out of his legal opinions."

Before the 1953 law, oil and gas leases on state lands were for a maximum of 20 years. The case went to the U.S. Supreme Court after the Montana Supreme Court had declared the indefinite-term law invalid *(The Oil and Gas Journal, March 21, page 129)*.

Spacing Rule Due Soon

HELENA, Mont.—The Montana Oil and Gas Conservation Commission is scheduled to announce a decision about mid-April on whether 80-acre spacing will be established in the state's newly discovered oil fields.

Spokesmen for major oil companies generally favored the commission-sponsored proposal at a recent hearing in Helena.

Trans-Canada Stymied

Company says construction of 2,200-mile line to move Alberta gas to eastern Canada will be delayed a year

CALGARY.—Plans to transport Alberta natural gas to markets in eastern Canada have suffered a severe setback.

Trans-Canada Pipe Lines, Ltd., which had hoped to start construction of its $300,000,000 pipeline within a few weeks, announced the project will be delayed at least a year. The announcement followed collapse of negotiations aimed at financing the mammoth project.

Despite the setback, N. E. Tanner, Trans-Canada president, was confident that the 2,200-mile line eventually will be built. The company will seek an extension of its permit for construction of the system. The current permit will expire April 30.

The discarded plan for financing the line would have involved about $52,500,000 in aid from the Canadian Government. The plan was dropped when it became clear that government terms were not acceptable to some of the private interests.

Stumbling block . . . Reports indicated the government-owned Industrial Development Bank laid down terms under which it would have had effective control of Trans-Canada during the first few years of its operation. Some of the producers who would have supplied gas for the line balked at the implied threat of government control.

Strongest opposition to government control apparently came from Canadian Gulf Oil Co., subsidiary of Gulf Oil Corp. Canadian Gulf had been counted on to provide Trans-Canada about 180,000,000 cu. ft. of gas daily from its Pincher Creek field in Alberta. This would have been one-third of the line's proposed daily throughput of 540,000,000 cu. ft. per day.

"Gulf wouldn't have anything to do with selling gas to a government-owned pipeline," explained a spokesman for Trans-Canada.

"Trans-Canada Pipe Lines will, of course, continue its efforts to arrange the financing . . . from private capital sources," the company announced.

Prospects . . . Without government aid, it may be difficult to line up necessary backing for the project. As some observers in financial circles pointed out last week, the line could not be expected to operate at a profit during the first 2 or 3 years. Some Canadian officials, who had counted heavily on the line to bolster the country's economy, fear the project may never be built without government help.

Failure to start the project this year will not affect the gas-purchase contracts recently negotiated between the pipeline company and five producers. These contracts, covering about 125,000,000 cu. ft. of gas per day, reportedly set a price of 10 cents per M.c.f. in the field.

Although this price was considered high enough for shallow gas, it was pointed out that the price offered to Canadian Gulf might not have been enough to pay for development and gathering of gas in Pincher Creek field. Production there is from about 12,000 ft., and the field is about 250 miles from the proposed trunk line.

Without assurance of a supply from Pincher Creek, the proposed line will face an even greater obstacle.

Abandoned plan . . . The plan worked out with the government called for the Industrial Development Bank to put up more than half of the $100,000,000 to $105,000,000 needed initially. The government aid would be in convertible debentures which could be turned into equity stock.

The $100,000,000 plus would have paid for the first phase of the project—construction of a trunk line from Alberta to Winnipeg tying in with Northern Natural Gas Co.'s proposed line to Minneapolis, plus another line to bring imported gas into eastern Canada. Second phase of the project would have involved moving Alberta gas all the way to Montreal and other cities in eastern Canada. This would have cost another $200,000,000, which would have come from insurance companies.

Backers of the project proposed to raise remainder of the money needed immediately through sale of stock in Canada and the United States.

Plant Site Selected

MEDICINE HAT, Alta.—A 5-section area 3 miles northwest of this city's business district has been picked as the site for a $22 million nitro-chemical fertilizer plant to be built by Commercial Solvents Corp. of New York and New British Dominion Oil Co.

New British Dominion in partnership with Midcon Oil & Gas, Ltd., will supply the plant with its natural gas requirements, estimated initially at between 6 and 7 million cubic feet daily. The firm also will supply 3 million cubic feet daily to the city of Medicine Hat.

A $1,000,000 pipeline will be built to bring the gas from the Etzikom field. *(The Oil and Gas Journal, March 21, page 135).*

Drilling Steps Up

Big development program under way in Alberta

CALGARY.—A big development program will get under way soon to define the limits of southwestern Alberta's prolific Sundre-Westward Ho Mississippian area.

Home-Federated Group announced locations for two step-out tests immediately in the Westward Ho area. Five other wells have been started or planned for the area. Focal point of the activity is 55 to 60 miles north of Calgary and 20 miles west of Olds.

The Westward Ho discovery recently was completed flowing at the rate of 1,002 bbl. daily of 35.2°-gravity oil on 16/64-in. choke from perforations at 8,755-74 ft. in Mississippian. Operators were Hudson's Bay Oil & Gas Co., Ltd., and Home-Federated Group.

Sundre discovery, Hudson's Bay 1 Sundre, 7 miles northwest of Westward Ho, flowed 2,808 bbl. of 31.5°-gravity oil daily on ¾-in. choke from the Mississippian at 9,162-78 and 9,130-45 ft.

Shell To Add Platformer

VANCOUVER. — Shell Oil Co. of Canada, Ltd., will add a 3,300-bbl. Platformer at its refinery at North Burnaby, B. C.

Contract for construction of the unit has been awarded to Procon (Canada), Ltd. It is scheduled to be completed late this year.

Shell recently completed a $10,000,000 expansion program which doubled the plant's capacity. New facilities added include a catalytic cracking unit, a vacuum flasher, a gas-recovery plant, blending facilities, storage tanks, and other units.

Refinery Contract Awarded

MOOSE JAW, Sask.—Husky Oil & Refining, Ltd., has awarded contract to Fluor Corp. of Canada for the bulk of a million-dollar expansion and modernization program at its Moose Jaw Refineries, Ltd., plant here. Husky bought the plant last November from Trans Empire Oils, Ltd.

Plans call for installing a desulfurization unit and a Catformer.

The program will increase Moose Jaw plant's capacity from 2,000 bbl. daily to 5,000 bbl. The work is scheduled for completion in July.

Husky also plans to increase the capacity of its Riverlake refinery at Fort William, Ont., to 5,000 bbl. daily and its Lloydminster refinery to 8,500 bbl.

Husky has budgeted another $1,500,000 for crude oil exploration and lease development. The program calls for 55 wells to be drilled by the company and another 15 by other firms on Husky's 1,336,000-acre holdings in Saskatchewan.

Westcoast Sells Gas

VANCOUVER, B. C.—British Columbia's southern mainland was assured of Peace River Valley natural gas recently when B. C. Electric Co., Ltd., signed a contract with Westcoast Transmission Co., Ltd.

A. L. Grauer, president of B. C. Electric, said that his firm would pay a sliding-scale price based on volume. The price to the consumer would be set by the province's Public Utilities Commission. Grauer also described the contract as "better than those offered U.S. cities by Pacific Northwest Pipeline Corp." He estimated that the cost for household use and heating commercial buildings would be 25 per cent lower than manufactured gas.

Tentative plans call for the first delivery in October 1957.

GULF COAST

New Offshore Field

Magnolia discovery is fifth off Texas coast

PORT ARTHUR, Tex. — Magnolia Petroleum Co. is opening Texas' fifth offshore field.

The latest discovery, a gas producer, is in State Tract 10, Gulf of Mexico, 8 miles off the coast of Jefferson County and 12 miles southwest of Sabine Pass.

The discovery well is estimated good for 25,000,000 cu. ft. of gas daily, based on preliminary drill-stem tests. Ungaged flow through ¼-in. and ⅛-in. chokes was under pressure of 3,525 psi. Shut-in pressure built up to 3,780 psi.

Production is from casing-perforated sand at 8,016-30 ft. This hole was plugged back from 13,386 ft.

Following completion of this well, Magnolia will drill another test from the same platform, deviating the hole to a subsurface location under Tract 9, west of the discovery.

Earlier strikes . . . Texas' first commercially productive offshore field (Chevron) was opened by Standard Oil Co. of Texas last July off Kleberg County in the lower coastal area. Three wells, all oil producers, have been completed so far.

Opening of this field was followed in September with a dry-gas discovery (Sprint) 10 miles down the coast by Sun Oil Co. The discovery well, just offshore, was directionally drilled from a surface location on Padre Island. Sun's first follow-up well was a failure.

Early this year, Shell Oil Co. extended production of its Kain field on Matagorda Peninsula, Matagorda County, to the Gulf of Mexico, giving Texas its third offshore field. The extension well, which also produced dry gas, was drilled directionally from shore.

The state's fourth offshore field, located off Nueces County, was opened by Gulf Oil Corp. last February. Discovery well, in Block 889, about 4 miles from shore, produced oil from an 11,450-ft. sand.

Gulf Line Planned

Firms study gas project linking Texas, Florida

HOUSTON.—Two companies are reportedly drafting plans for a 1,500-mile natural-gas transmission line between McAllen, in South Texas, and Miami, Fla.

Coastal Transmission Co., headed by John Sue and backed by the Clint Murchison interests, would construct the initial 550 miles of 30-in. line terminating near Baton Rouge, La.

Plans call for Houston, Texas Gas & Oil Co. to build a tie-in there and construct 600 miles of 30-in. line and 350 miles of 24-18-in. line to carry the gas to Miami. This line has J. O. Mack as president; Paul Herzig as chief engineer; and Floyd E. Stanley of Midwestern Constructors Inc., Tulsa, as chairman.

Backers propose to move an initial 350 million cubic feet of gas daily over the line. But they face several major obstacles in completing their plans. They will have tough competition for a gas supply, must tie down sales outlets, get Federal Power Commission approval, and obtain financing.

Coastal will face stiff competition, in procuring gas, from many pipeline companies, including Tennessee Gas Transmission Co. This firm already has asked FPC permission to loop 270 miles of its trunk line from Agua Dulce, South Texas, to Kinder, La. *(The Oil and Gas Journal, February 7, page 80.)*

This line would tie in with T.G.T.'s system carrying gas from Kinder to Portland, Tenn., and would practically parallel Coastal's proposed line. The system would put T.G.T. in position to bid for offshore and coastal gas in the same area traversed by Coastal.

Sales in Florida also pose a problem to the project. Florida has a mild climate which makes home heating a minor factor. Industries there are limited and subject to fluctuating demands. Fuel oil delivered to coastal ports also would be a major competition to any natural gas brought in.

U.N. Report Disputed

American oil firms, government spokesmen join in attack on E.C.E. study of high crude prices in Western Europe

Dahl M. Duff

AMERICAN oil companies with interests abroad have branded a United Nations report criticizing the oil price structure in Western Europe as "inaccurate," "loosely drawn," and "prejudiced."

Company and governmental spokesmen reacted quickly after the report was published last week by the United Nation's Economic Commission for Europe. They issued statements trying to offset effects of blackeyes received from the publicity.

The report, termed an economic hodgepodge in some American quarters, emphasized these factors:

. . . **Western Europe** pays too much for Middle East crude because it's linked to United States prices without regard to widely different costs.

. . . **Excessive competition** by independent oil producers could lead to over-exploitation.

. . . **A system of big cartels** under government control might be the best way to finance development and still protect interests of consumer and producing countries alike.

Prospects are the furore created by the document may quickly fade. It may be sent to government file rooms and be forgotten because any further action now is up to the interested governments. But neither they nor the E.C.E. seem inclined to pursue the vague recommendation that oil prices be controlled by an inter-governmental agency.

The document first was prepared at E.C.E. headquarters in Geneva as a working paper for the agency's coal committee. Word got around in Geneva several weeks ago that "oil interests" attempted to suppress the study. Garbled accounts attacking the industry appeared widely in the European press *(The Oil and Gas Journal, March 7, page 82).*

Communists in Europe made only a mild effort to capitalize on the report then or later. At the coal committee's meeting in Geneva, a delegate from Russia's Ukraine asked for more of "this very interesting research" into the petroleum industry. Gunnar Myrdal, Swedish executive secretary of E.C.E., said his secretariat always was studying fuel problems and the oil situation would be kept in mind.

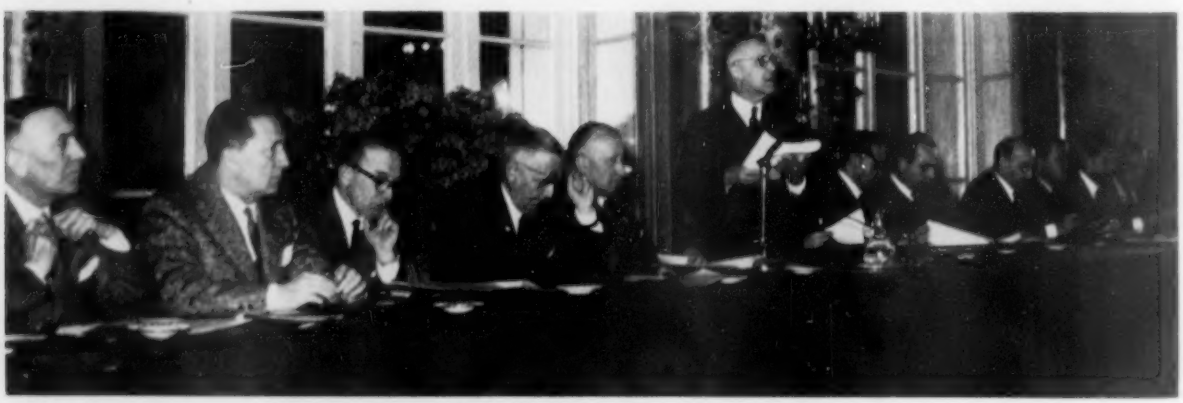
Actually, Communists are in a poor position to make much of the report for propaganda purposes. Russian and Romanian oil began to reenter world markets about 2 years ago, mainly under bilateral trade agreements. But all of it sells at full world market prices. Russia's trade missions have shown no disposition to upset the existing price structure which the E.C.E. study claims is unfair to the Western European consumer.

U. S. stand . . . United States and Britain made no secret they objected to the oil pricing report in the first place. American and British oil companies dominate the international oil trade and were targets of the analysis. Furthermore, the U. S. State Department regarded it as providing more ammunition for those interested in stirring up anti-American prejudice in Europe.

After the report was released and placed on sale in the U.N. book store in New York, the U. S. Government issued a statement through its mission to the U.N. It said the apparent suggestion for international controls over oil prices "would be contrary to United States government policy."

"The study deals with a complex and highly controversial subject, and its publication will enable both governments and private groups to undertake such examination and scrutiny as they may choose to give it," the U. S. statement said.

The American reply made it clear that the U.S. representative on the coal committee acquiesced to release of the document only because of previous "unauthorized disclosure of the contents." The study was prepared by the E.C.E. secretariat on its own initia-



Preparations Made for Fourth World Petroleum Congress

Final details are being added to the general program for the fourth World Petroleum Congress, to be held in Rome, June 6-15. Shown discussing the program with a group of press correspondents is Prof. Marcello Boldrini. Flanking him are members of the general organizing committee and of the press committee of the congress. At his right are Marchese Pennavaria and Gr. Uff. D'Amelio, both vice chairmen of the general organizing committee; at his left is Dr. Cassaniga, vice chairman of the general organizing committee. Nine sections of technical papers will be presented at the forthcoming congress, ranging from exploration and drilling through refining and petrochemical subjects. Four lectures of wide petroleum interest also will be presented: "Evolution of Oil Exploration," by P. T. Cox, of British Petroleum Co., Ltd.; "Design of Petrochemical Equipment," by Prof. Jungers, of University of Louvain; "Energy Resources," by Dr. W. K. Lewis, Massachusetts Institute of Technology; "Natural Gas in Italy," by Ing. Enrico Mattei, chairman of Ente Nazionale Idrocarburi. There also will be a complementary "International Petroleum Exhibition" held at Naples, June 5-20.

tive, and since the coal committee did not consider its substance, it was published as the sole responsibility of the E.C.E. secretariat, the statement added.

British view . . . In Britain, where the original leaked versions of the report received some of the most sensational headlines, labor members raised the usual questions in the House of Commons. One member said the oil companies were the "chief contenders for the title of Public Enemy No. 1," but A. R. W. Low, minister of state for the Board of Trade, said he "felt safe in categorically denying this."

The minister said: "Price control is not the solution of all our problems, and before you introduce a system of price control, you have to find a yardstick."

Companies' protest . . . Meanwhile, the American companies concerned spoke up. They are the five important producers in the Middle East—Standard Oil Co. (N.J.), Socony-Vacuum Oil Co., Inc., Gulf Oil Corp., Standard Oil Co. of California, and The Texas Co. The principal American marketers of products in Europe are Jersey Standard, Socony-Vacuum, and Caltex (Standard of California and Texas).

R. G. Follis, Standard of California board chairman, attacked the report's "fragmentary, incorrect, or obviously slanted data." He said "the authors decline to deal with prices charged to the final consumer" because these prices are "heavily influenced by taxes in most countries and are largely a matter of internal policies."

Follis said profits in the Middle East are consistent with the returns on other foreign investments considering risks and they are necessary to provide the incentive for continued exploration and development. The fact that most American companies find it more profitable to stay in the United States indicates profits abroad are not as high as the report imagines.

Socony-Vacuum, through B. Brewster Jennings, its president, pointed out the report has been built up "far beyond its rightful status . . ." He said it contains no factual data that are in any way new.

Jersey Standard spotlighted the fact the report was drawn up by E.C.E.'s staff group and so far had not been endorsed by any responsible body. Among other points made by Jersey Standard was that the report erroneously stated net profit on Middle East production in 1952 was $1.40 per barrel.

"Costs for producing oil in the Middle East, like costs anywhere else, must include all royalties, taxes, and other payments . . . when these are taken into account, the $1.40 per barrel net which the papers alleged for 1952 could not have been more than 70 cents per barrel based on figures in the paper itself," Jersey Standard said.

W. F. Bramstedt, Caltex president, asserted the E.C.E. had given consumers "a misleading picture that could injure consumer interests and impair the oil industry's ability to meet Europe's growing needs."

Desert Wildcat

Egyptian-American plans test on huge concession

EGYPTIAN-AMERICAN OIL CO. is preparing to drill its first deep wildcat on a 50-million acre concession in the Western Desert which the Republic of Egypt granted a group of American oil firms early last year.

The well location is 28 miles southwest of Alexandria. The concession includes the entire part of the Western Desert lying between the Nile River and the Lybian border and north of the 28th parallel.

The concession originally was granted to Conorada Petroleum Corp. But later was assigned to subsidiaries of Continental Oil Co., Cities Service Co., Ohio Oil Co., and Richfield Oil Corp. Egyptian-American is the operator for the group.

Extensive exploration . . . Millard K. Neptune, Egyptian-American's general manager, said "this first wildcat well has been located in an area where we believe the sediments will be representative and maximum benefit can be obtained in the nature of geological information."

Initial preparations will permit drilling to 15,000 ft. if necessary.

Plans also call for adding a seismograph party and four company-operated surface geology parties this year. Other technicians will be employed to help clear land mines planted in the desert during World War II.

First since Belayim . . . Besides Neptune members of the Egyptian-American operating staff include James S. Royds, exploration manager; William F. Penniman, Jr., administrative manager; Don B. Eicher, chief geologist; Robert H. Bixby, chief geophysicist, and Bryan L. Denson, drilling superintendent.

The Egyptian-American operations are the first announced since discovery early this year of the new Belayim oil field by International Egyptian Oil Co. in the southern part of the Sinai Peninsula *(The Oil and Gas Journal, February 14, page 92)*. The Belayim discovery well flowed at the rate of about 1,150 bbl. daily from about 7,350 ft. in the upper Miocene formation. It has been shut in awaiting pipeline arrangements. Belayim was the first discovery in Egypt since 1948.

Portugal Play

Socony now directing exploration program

SOCONY-VACUUM OIL CO., INC., has taken over the direction of a government-backed exploration program that has been under way for several years in Portugal.

The company said under terms of an agreement recently signed in Lisbon it has undertaken to direct exploration as contractor with a participating interest in the benefits of a concession held by Cia. dos Petroleos de Portugal. The amount of the Socony-Vacuum interest was not revealed.

Petroleos de Portugal is mainly owned and financed by the Portuguese Government and the Alex Johnson interests, Stockholm, Sweden.

Socony-Vacuum will conduct the program in the name of its recently founded Delaware subsidiary, Socony-Vacuum Exploration Co., with offices in Lisbon. Two Magnolia Petroleum Co. officials have been transferred to Portugal, and one or two other Americans will probably be added to the staff in the near future.

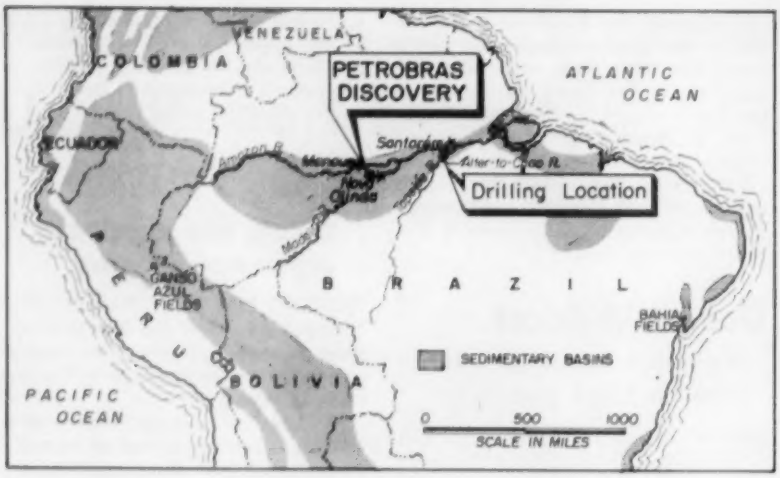
Transferred from Magnolia were L. H. Porter, to be local manager, and Forrest Wimbish, to be chief of exploration. Porter joined Magnolia in 1918 and since 1948 has been assistant general superintendent of the part-interest operations department of Magnolia's producing division. Wimbish joined Magnolia in 1949 and since 1952 has been senior district geologist in Midland.

Australian Wildcat Dry

Location for a second wildcat in eastern Australia has been staked by Lucky Strike Drilling Co., Tulsa, which abandoned its first venture there at 9,773 ft.

Gene Goff, president of the company, said no shows of oil were encountered in the 1 Cherwell Creek. The failure was drilled near Maryborough on a Lucky Strike concession originally totaling more than 3,600,000 acres *(The Oil and Gas Journal, August 23, 1954, page 112)*.

Lucky Strike's second venture in Australia, the 1 Susan Creek, will be about 25 miles southeast of the Cherwell Creek test. It is projected to about 9,000 ft.



Brazil Finds More Oil

Amazon basin discovery is rated at 600 bbl. per day; strike is nearly 1,000 miles from nearest production

THE first oil discovery in the vast Amazon basin has been confirmed by Brazil's government-owned oil monopoly, Petroleo Brasileiro, S.A. The successful wildcat is about 100 miles southeast of Manaus on the bank of the navigable Madeira River.

Petrobras has announced that oil found in the Devonian at 8,910 ft. flowed at a rate of 600 bbl. daily. It was light crude of from 40° to 50° gravity. Further tests are being made.

The well, being drilled by Drilling & Exploration Co., was located on the basis of seismograph work indicating a large anticline. Drilling will be continued in the hope of reaching basement rock. Thick salt formations were encountered above the pay zone.

The wildcat, located near the town of Nova Olinda, is the same well that caused considerable excitement in Brazil at the end of 1952. Oil-stained siltstone found at that time led to unfounded reports of a shallow discovery. The well was spudded November 4, 1952.

A second rotary rig is drilling for Petrobras about 200 miles east of Nova Olinda, at the mouth of Alter-to-Chao River, 15 miles south of Santarem, Brazil's chief interior town. The well was spudded about 7 months ago. As at Nova Olinda, thick salt formations were drilled through at upper levels.

The nearest other test to Nova Olinda was a dry hole on Marajo Island at the mouth of the Amazon River, 800 miles away. Three dry holes were drilled in this area in 1950-53.

Importance . . . Helio Beltrao, managing director of Petrobras, spoke optimistically in New York about the Nova Olinda discovery. He said the discovery was Brazil's most important oil event since the organization of Petrobras.

He pointed out that the Nova Olinda discovery was the first oil find in Brazil outside the Bahia fields on the Atlantic Coast. Petrobras tankers, he said, can navigate the Amazon and Madeira rivers to the well site.

The well is in the heart of the immense Amazon basin sedimentary area which covers 309,000 sq. miles within the boundaries of Brazil. The location is more than 1,000 river miles from the Atlantic Ocean. It is about the same distance from the nearest oil production in any direction.

Brazil's Bahia fields are about 1,500 airline miles to the southeast. Producing fields of Eastern Venezuela are nearly 1,000 miles to the northwest.

The closest available crude source to the interior of Brazil at present is Ganso Azul field, on the Amazon tributary in eastern Peru. Ganso Azul crude has been expected to be the source of supply for a 5,000-bbl. refinery to be built at Manaus by a private Brazilian company, Cia. de Petroleo de Amazonia, S.A. This plan, however, would provide a desirable and nearby market for the new Nova Olinda production if development work bears out its present promise.

New refineries will reduce . . .

. . . Brazil's Demand for Imports

BY the end of this year Brazil will be refining 110,000 bbl. of crude daily, or enough to take care of 80 per cent of domestic needs.

This is the forecast of Helio Beltrao, managing director of the government-owned oil monopoly, Petroleo Brasileiro, S.A. By increasing its crude imports and reducing its products purchases, Brazil will cut $60,000,000 from its annual $250,000,000 oil-import bill, Beltrao predicted.

This saving will be a source of financial support for Petrobras, he said. The Brazilian Congress has granted the oil monopoly the right to use 80 per cent of the foreign exchange it saves yearly.

Beltrao said in New York that three refineries with a total capacity of 80,000 bbl. daily have gone on strean recently in Brazil. The plants are the 50,000-bbl. Petrobras refinery at Cubatao; the 20,000-bbl. Capuava refinery owned by the private Brazilian company, Refinaria Uniao, S.A.; and the 10,000-bbl. Rio de Janeiro refinery owned by another private Brazilian company, Refinaria de Manguinhos, S.A.

Finances . . . Petrobras now has $300,000,000 worth of foreign contracts outstanding. Of this sum, $200,000,000 is for the long-term supply of crude for the refinery at Cubatao. The remainder is for contracts covering such things as engineering services, technical assistance, construction supervision, drilling, exploration, and the construction of an asphalt plant of 3,500 bbl. daily input and an ammonium nitrate fertilizer plant of 120,000 tons capacity a year.

"Petrobras has counted, since its beginning, on foreign help in terms of contracting, financing, know-how, and equipment. It welcomes this foreign help, which has been valuable in the past and will be even more valuable in the future," Beltrao said.

Although Petrobras is relatively new, it already is one of the country's biggest corporations, if not the biggest, Beltrao added. It will spend an estimated $150,000,000 this year, and it has more than 10,000 employes.

Beltrao emphasized that the legal private status of Petrobras, its freedom to contract and do business, and its financial backing have given it "an extraordinary flexibility which it is willing to use to the best advantage of the Brazilian oil industry."

Brazil's present oil production is lim-

ited to the Bahia fields which have a production potential of 6,000 bbl. daily, Beltrao sand. Crude from the fields is processed at the Mataripe refinery, near Salvador. Estimated reserves are 100,000,000 bbl., and efforts are being made to increase the production at Bahia to 15,000 bbl. daily.

Beltrao said he saw no chance of approval of legislation to permit Petrobras to grant exploration concessions to foreign firms. Such a bill has been introduced in the Brazilian Congress.

Arab Zone Dry

Aminoil's Wafra wildcat fails to find deep pay

THE American Independent Oil Co.'s deep wildcat, Wafra 1-A in the Saudi Arabia-Kuwait Neutral Zone, has drilled into the Hadriya formation at around 10,000 ft. without finding production in the Arab zone.

The well discovered a new pay zone last November in the Ratawi limestone below 6,500 ft. Drillers encountered about 100 ft. of oil column and tested 2,400 bbl. daily of 25.6°-gravity crude. Drilling subsequently was resumed toward the deeper Arab zone. *(The Oil and Gas Journal, November 22, p. 76).*

The 15 producers completed thus far in Wafra field all take oil from the shallower Burgan horizon (Middle Cretaceous) at about 3,500 ft. Below this lies the third Zubair pay formation (Lower Cretaceous) in Zubair field in Iraq. Then comes the Ratawi and finally the Arab zone (both Jurassic).

Aminoil is drilling for the joint account of itself and Pacific Western Oil Corp. They both hold concessions in the Neutral Zone, and the venture originally intended to test the Arab zone. Aminoil had drilled a wildcat in the Shadhaf area south of Wafra field. It was unproductive in the Burgan, but operators did not go into the Arab zone.

Production in December from Wafra field averaged 24,000 bbl. daily, conforming to market demand at the time.

Pacific Western is now moving its share of the crude out through a new terminal at Ras Az Zor on the Neutral Zone coast. Facilities include a 10-in. line from Wafra field, two 200,000 bbl. tanks, and a 20-in. submarine line extending into water deep enough to take the largest tankers afloat. A 165,000 bbl. cargo was lifted from the new terminal in early March.

Aminoil exports its production through a terminal completed about a year ago south of Mena-Al-Ahmadi in Kuwait.

Bolivia Seeks Wildcat Money

President says future petroleum legislation will enable country to appeal more to foreign capital

BOLIVIA, now engaged in developing export markets for its small but growing production, is about to go after more foreign exploration capital.

President Victor Paz Estenssoro, warning against his country's economic dependence on tin, said more attractive petroleum legislation would be promulgated within a few months.

Details of the new law are still secret. However, Paz Estenssoro said that with the help of foreign money Bolivia could be exporting $65,000,000 worth of oil annually within 4 years.

Yacimientos Petroliferos Fiscales Bolivianos, a government agency, controls the oil industry. A law which the government sponsored several years ago for mixed-company operations failed to net any foreign companies. Glenn McCarthy, now drilling in the southeastern part of the country, is the only foreign operator in Bolivia since the expropriation of Standard Oil Co. (N.J.) in 1937.

Meanwhile Y.P.F.B. has signed a contract with Williams Brothers, Tulsa, to build the Cochabamba-Oruro-La Paz products pipeline. Eventually a 10-in. branch from Oruru to Arica, Chile, will be laid.

The cost of the 230-mile, 6-in. line is estimated at $7,045,000. Williams Brothers will receive $4,500,000 in a series of payments extending to August 19, 1957. The remainder will be spent for pipe and equipment. The Bolivian Government estimates the line will save it about $2,690,000 annually.

Work on the project is scheduled to get under way as soon as Williams Brothers finishes the 6-in. line it is now building for the government from Camiri field to Yacuiba on the Argentine border. This line has reached a point halfway between Boyuibe and Villa Montes and is expected to be completed into Yacuiba by May.

Y.P.F.B. has already started crude deliveries to Argentina through the section of the line. The oil is moved from Boyuibe on to Argentina by rail pending completion of the line. About 425 bbl. daily is being shipped into Argentina.

Bolivian crude production is now running in excess of 6,000 bbl. daily, more than four times what it was a year and a half ago. This output is better than half internal consumption, so export outlets are being developed in nearby parts of Argentina, Brazil, Chile, and Paraguay.

Y.P.F.B. has been meeting with further success in its exploration work. A well was recently brought in at El Toro in Bermejo field for about 200 bbl. daily of heavy oil. The government expects that further drilling will develop enough of this crude to meet Bolivian needs for fuel and asphalt. At Guiruri, south of Camiri, Y.P.F.B. has completed a well for 300 to 375 bbl. daily.

Uruguay Plans New Search

The Uruguayan Government organization, ANCAP (Administration Nacional de Combustibles, Alcohol y Portland) has contracted with Dunlap & Graham to drill six wells in the country during the next 2 years.

The contractor will use a diesel rig good for 10,000 ft. The rig has been shipped from Los Angeles. It will be ready to drill in April. Under the contract, ANCAP can buy the rig at any time.

At least one well will be drilled at Santa Lucia, about 30 miles north of Montevideo where oil shows were obtained several months ago in a water well at about 3,600 ft. Three other wells are projected in northern Uruguay.

There is no oil production in Uruguay. ANCAP holds the refining monopoly and operates a 28,000-bbl. daily plant at Montevideo. Crude for the refinery is imported.

Iranian Boards Completed

Appointment of two more Iranians rounded out membership of boards of directors for two companies now handling oil operations in Iran.

Rahmatollah Ghavami was named to the board of Iranian Oil Exploration & Producing Co. Ghavami, 51, educated in England, formerly was with British Petroleum Co., Ltd., the old Anglo-Iranian Oil Co. Since settlement of the Iranian oil dispute last fall, he has been administrative coordinator in the fields and deputy to the general fields manager, J. J. O'Brien, formerly with The Texas Co.

Mahmood A. Poozeshi, 44, for 28 years with Anglo-Iranian and later National Iranian Oil Co., was named to the board of Iranian Oil Refining Co. He has been chief engineer at Abadan refinery during its 3 years of operation under National Iranian Oil.

Catalytic Reforming Economics in High-Octane Sweepstakes

The decade since the end of World War II has been marked by the production of automobiles with increasing engine compression ratio and more and more horsepower. The average of the compression ratios of domestic 1955 automobile engines is in excess of 8.1 to 1; horsepower averages close to 200, and forecasts are being made that by 1960, 300-hp. engines will be the rule and not the exception.

Because it is possible to utilize efficiently the high horsepower output of today's automobile engines only by fueling them with high-octane gasolines, the progressive refiner has been forced into a "high-octane derby" in which he must provide gasolines of higher and higher octane number.

Premium motor fuels of 97-98 (F-1) octane are presently being marketed, and the entire refining industry is anticipating 100-octane premium fuels in the immediate future. In this connection, two questions may be asked—and it is the purpose of this study to provide the answers.

First, how may 100 F-1 clear octane gasoline be obtained? Although one answer may be production of motor-gasoline alkylate, the drawback here is that the ultimate quantity of this alkylate probably is limited. Therefore, the most likely solution would appear to lie in the reforming of low-octane straightrun naphthas to extremely high octane levels—98 to 100 F-1 clear.

Next, what is the most economical way of achieving these octane levels by reforming?

In answer to this question, this paper presents data and conclusions based on experimental runs in the pilot plants of Houdry Process Corp.'s laboratories at Linwood, near Marcus Hook, Pa.

In each of these different runs, the basic process employed was Houdriforming, either alone or in combination with additional processing. In the systems employing Houdriforming plus additional processing, the new process name "Iso-Plus" has been adopted by Houdry Process Corp. to distinguish these combination methods of reforming for 100 F-1 clear octane motor fuel.

100 CLEAR OCTANE

. . . by the new Houdry "Iso-Plus" Process

by H. D. Noll, J. W. Schall, R. G. Craig, and D. H. Stevenson

BROADLY speaking, there are three routes by which 100 F-1 clear reformate may be obtained:

- Single-stage severe Houdriforming;
- A combination of Houdriforming and aromatics extraction; and
- Houdriforming at moderate severities followed by thermal reforming of the Houdriformate.

Single-stage severe catalytic reforming for 100 F-1 clear octane has limitations from a process standpoint, inasmuch as this octane level can be achieved only with naphthas of moderate to low paraffin content, even with regeneration.

The other two routes, which involve Iso-Plus Houdriforming, are quite flexible. Either one yields high-octane reformate in a continuous operation with almost all virgin naphthas. The Iso-Plus combination of catalytic reforming and aromatics extraction is extremely flexible, and many different processing schemes may easily be visualized.

Reforming Study

To arrive at economic comparisons important to refiners in the "high-octane sweepstakes," this study postulates the reforming of 6,000 bbl. per calendar day of a typical 200°-394° F. (A.S.T.M.) virgin naphtha containing 46 per cent paraffins to 100 F-1 clear octane, by four methods. Inspections of the charge naphtha are shown in Table 1.

Authors are associated with Houdry Process Corp., Philadelphia, as respectively director of engineering, director of development, assistant engineer, and section head, process development.

TABLE 1—INSPECTIONS OF REFORMER CHARGE

Gravity, °A.P.I.	51.0
Distillation, °F.:	
I.b.p.	200
10 per cent	230
50 per cent	295
90 per cent	365
End point	394
Sulfur, weight per cent	0.125
F-1 clear octane	54.1
Composition, volume per cent:	
Paraffins	46
Olefins	
Naphthenes	37
Aromatics	17

Since the virgin naphtha contains 0.12 weight per cent sulfur, it is pretreated in all cases to reduce the sulfur content to 0.01 weight per cent or lower. In cases involving aromatics extraction, the Arosorb* process is used.

The four cases considered in this study may be summarized as follows:

Case 1 . . . This is severe, one-pass catalytic reforming as illustrated in the simplified block flow diagram (Fig. 1). Naphtha is pretreated and stripped for sulfur removal. Since this reforming scheme requires relatively frequent regeneration of the catalyst, three 3,000-bbl. per calendar day four-reactor reformers, with common pretreat and stabilization sections, are provided in parallel.

Two of these lines of reactors process naphtha while catalyst is undergoing regeneration in the third. Reformate is flashed, and the flash-drum liquid is charged to the stabilizer for production of finished 10-psi. R.v.p. gasoline.

Case 2—Iso-Plus Houdriforming—This involves moderate Houdriforming of the virgin naphtha, aromatics separation, and separate Houdriforming of the paraffinic concentrate. This is diagramed in Fig. 2. After pretreating and stripping, the naphtha is Houdriformed at moderate severity to 87 F-1 clear octane. After flashing, the liquid product is first depropanized, and then depentanized. Butanes and pentanes go to product.

Depentanized Houdriformate is charged in this case to an Arosorb unit where an aromatic concentrate containing 91 per cent aromatics is separated as product. (Any other extraction process yielding an equivalent aromatics

*Arosorb is an adsorption process licensed by Sun Oil Co.

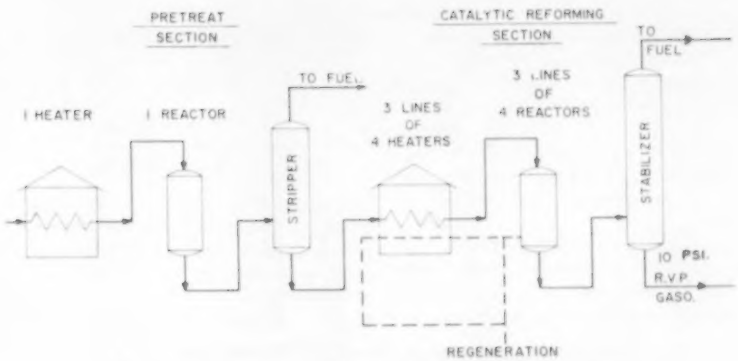


Fig. 1—This is severe, one-pass catalytic reforming—Case 1.

concentration may be used.) The paraffin concentrate containing 81 per cent paraffins is charged to a second Houdriforming unit and reformed to 81 F-1 clear octane.

This reformate is flashed and depropanized. The final blend of 100 F-1 clear octane consists of the aromatic concentrate, butanes and pentanes from the first Houdriformer and depropanized Houdriformate from the second reformer.

Case 3—Iso-Plus Houdriforming—This is also a combination of Houdriforming and aromatics separation, as shown in Fig. 3. In this case, the virgin naphtha and paraffin concentrate from the Arosorb unit are combined and processed in a single Houdriforming unit to an 83 F-1 clear octane level. The reformate is depropanized and debutanized. Most of the butane and part of the debutanized reformate go to final product.

The remaining debutanized reformate is dependentanized with pentanes going to product. The dependentanized reformate is charged to an Arosorb unit. The aromatic concentrate from the Arosorb unit goes to product, and the paraffin concentrate is recycled to the Houdriformer.

Case 4—Iso-Plus Houdriforming—This is a combination of Houdriforming and thermal reforming of the Houdriformate, as diagramed in Fig. 4. After pretreating and stripping, the virgin naphtha is Houdriformed to 87 F-1 clear octane. The debutanized reformate is thermally reformed to produce a high-octane product. The recovered propene and butenes from thermal reforming are converted to polymer gasoline.

Process Yields

The yields of products and quantities of process streams for all four cases are presented in Table 2. From this tabulation, comparisons of the final plant yields, as well as yields at any point in the process schemes, may be made.

The lowest yield of 100 F-1 clear octane gasoline occurs in Case 1. This results from the necessity of going to extremely high severity to obtain reformate of the high-octane level sought.

Since octane improvement in catalytic reforming results largely from aromatics production, obviously the highest yield of product will be obtained by producing the maximum yield of

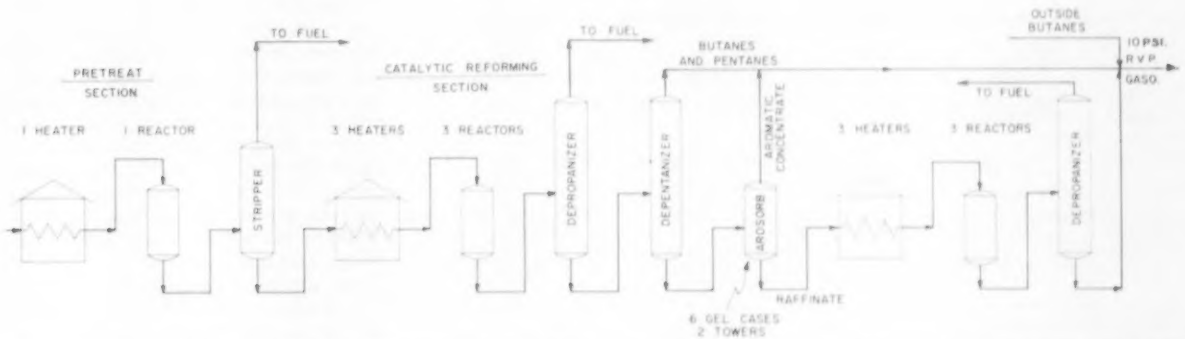


Fig. 2—Iso-Plus Houdriforming. Moderate Houdriforming of virgin naphtha, aromatics separation, and separate Houdriforming of parraffinic concentrate—Case 2.

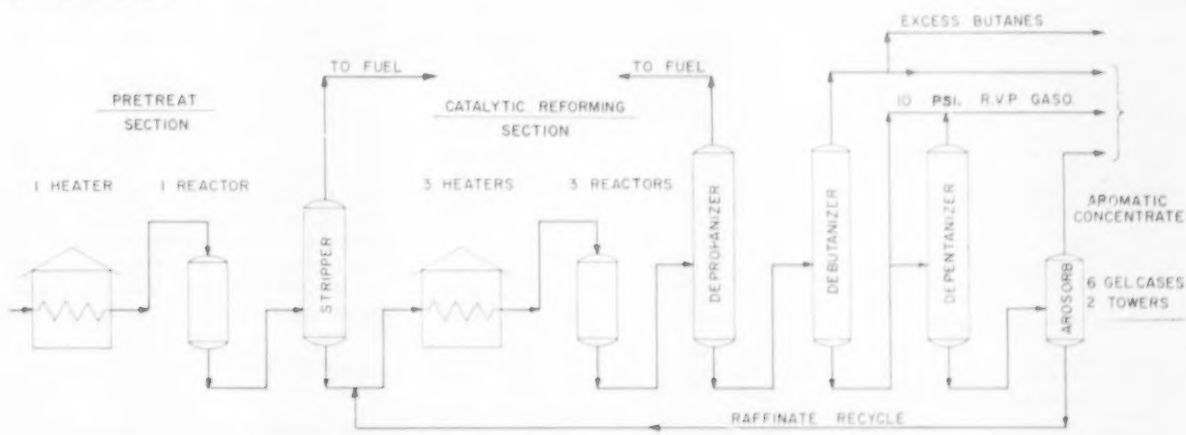


Fig. 3—Iso-Plus Houdriforming. Virgin naphtha and parrafin concentrate processed in single Houdriforming unit—Case 3.

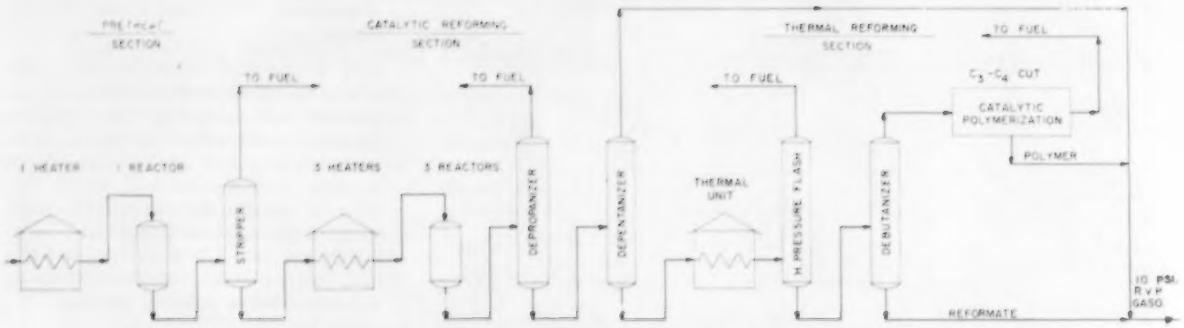


Fig. 4—Iso-Plus Houdriforming. Combination of Houdriforming and thermal reforming of Houdriformate—Case 4.

aromatics. In severe once-through reforming, this is difficult because little paraffin aromatization can occur when such large concentrations of aromatics are already present from the converted naphthenes and aromatics in the charge.

The tendency, instead, is to crack paraffins to lower-molecular-weight liquid and gaseous products. This results in the necessary octane improvement at a high loss of yield.

Paraffin aromatization . . . Cases 2 and 3—Iso-Plus Houdriforming—take advantage of the characteristic ability of Houdriforming to aromatize paraffins when present in high concentrations. In Case 2, the highest yield of gasoline is produced by first reforming to a moderate octane where essentially all naphthenes have been converted to aromatics, and no drastic loss of paraffin has occurred.

Separating the aromatics from the paraffins then permits a high degree of paraffin aromatization to be obtained in a second-pass reformer. Thus a more efficient over-all conversion of charge to high-octane reformate is accomplished.

Case 3 also takes advantage of increased paraffin aromatization by increasing the paraffin concentration in the reforming step. However, it cannot be accomplished as efficiently as in Case 2, since the paraffin reforming is done in combination with the fresh-feed reforming. This results in a somewhat poorer yield than Case 2.

Thermal reforming . . . Case 4 takes advantage of the thermal stability of aromatics and the characteristic of thermal reforming to produce high-octane olefins from low-octane paraffins. By Houdriforming first to a moderate octane, a substantial yield of aromatics is produced. The total reformate is then subjected to thermal reforming. This results in upgrading the paraffinic portion of the reformate with little or no loss of aromatics.

The yield of reformate is somewhat poorer than from severe Houdriforming; however, more than enough propene and butene are produced and recovered to offset this deficiency with catalytic polymer gasoline. The net result of this Iso-Plus Houdriforming variation is a somewhat greater yield of high-octane product than from severe Houdriforming. This product differs from the other products in that it contains less aromatics and more olefins.

An additional point in favor of Iso-Plus Houdriforming is that no regeneration of Houdriforming catalyst is required even with the production of 100 F-1 clear octane gasoline. Very long catalyst life will be realized, since all Houdriforming in these cases is done at moderate severity.

TABLE 2—YIELDS AND PROCESS STREAMS (SERVICE FACTOR 0.909)
(Barrels per stream day)

	Case 1	Case 2	Case 3	Case 4
Feed to pretreater		6,600		
Pretreated reformer feed		6,600		
Recycle raffinate			3,531	
Total reformer feed	6,600	6,600	10,131	6,600
Yields from reforming:				
Reformate, C_5+	5,003	5,900	8,753	5,900
Butanes	653	271	574	271
Fuel gas, F.O.E.	938	422	818	422
Reformate octane, F-1 clear	100.4	87.0	83.0	87.0
Charge to debutanizer	5,656		9,327	6,171
Charge to depentanizer		6,171	7,068	
Depentanizer bypass stream			1,685	
Arosorb charge		5,603	6,545	
Aromatic concentrate		3,174	3,014	
Raffinate		2,429	3,531	
Yields from second pass reforming:		Houdriform raffinate		Thermal reform reformate
Reformate, C_5+		1,932		4,807
Heavy polymer				33
Butanes		246		143
Butenes, recovered for cat. poly chg.				273
Propene, recovered for cat. poly chg.				183
Fuel gas, F.O.E.		293		491
Reformate octane, F-1 clear		81.0		99.6
Catalytic polymer gasoline				328
Over-all yields:				
Butane free gasoline	5,003	5,403	5,222	5,135
Butanes for 10-lb. R.v.p.	501	590	529	536
Total 10-lb. R.v.p. gasoline	5,504	5,993	5,751	5,671
Excess butanes	152	*73	45	*122
Fuel gas, F.O.E.	938	715	818	913
F-1 clear octane of 10-lb. R.v.p. gasoline	100.0	100.0	100.0	100.0

*Outside butanes required.

Process Economics

Relative economics of the four cases are given in Table 3. A measure of the economies of any of the processes may be determined by obtaining the cost of the gasoline byproducts when assigning a value to the charge stock. The byproducts' costs, in cents per gallon, for the four cases, with 8-cent per gallon naphtha charge stock, are as follows:

Case 1	Case 2	Case 3	Case 4
10.5	9.99	10.34	10.04

To further expand the economic tables, investments must be considered.

If 25 per cent is assigned for plant amortization, interest on investment and taxes, the relative byproduct costs per gallon become:

Case 1	Case 2	Case 3	Case 4
11.57	11.06	11.44	10.96

These costs show that both Case 2 and Case 4 are most attractive. As the price of charge stock increases, Case 2 becomes even more attractive since the highest yield of 100 F-1 clear octane is achieved in this case; conversely, the lowest degradation of expensive charge stock is obtained.

Case 4 best . . . The economic summary in Table 3 shows that Case 4 is the most attractive Iso-Plus Houdriforming process for reforming this particular charge stock to 100 octane. When compared with Case 1 (severe Houdriforming), Case 4 has a lower investment cost, produces more gasoline, and has a higher net daily income. The economics for Case 4 would be still more favorable if a refiner had idle thermal reforming equipment available. (The study assumes all new equipment for thermal reforming and catalytic polymerization.)

Case 2 is the next most attractive Iso-Plus process scheme. Although this case has the highest investment cost, it produces substantially more 100-octane gasoline than the other cases, and has the greatest promise for higher octane levels in the future.

Looking still further into the future the question arises as to how high an octane can be produced from the four process schemes here presented.

Case 1 is already at the ultimate octane that can be produced in a feasible operation.

The product from Case 4 Iso-Plus Houdriforming can be upgraded somewhat further by increasing the thermal severity.

The octane of the product from Case 3 Iso-Plus Houdriforming can be increased to 105 F-1 clear at the expense of reforming a larger recycle paraffin stream.

By means of a slight modification, Case 2 Iso-Plus Houdriforming presents the most desirable means of further increasing the product octane. Recycling the second-pass reformate to the Arosorb unit, and thus recycling the paraffins to ultimate conversion to 91 per cent aromatic concentrate, pentanes and lighter, makes it possible to produce approximately 4,950 bbl. per calendar day of 108 F-1 clear octane 10-lb. R.v.p. gasoline from 6,000 bbl. per calendar day of charge. This gasoline will also blend at a somewhat higher value in lower octane-gasoline pools.

Maximum octane . . . Since this modification in Case 2 would produce the maximum octane product, it may be necessary to use this modification to produce 100 F-1 octane gasoline from high-paraffin-content charge stocks. The ultimate octane that can be produced in the modified Case 2 Iso-Plus Houdriforming is lowered slightly by increasing the paraffin content of the charge stock. This results from a greater portion of the charge going to pentanes and lighter than with a lower paraffin content charge stock.

The ultimate octanes for the other cases are lowered to an even greater extent since Case 2 represents the most efficient means of upgrading the paraffin in the charge.

Summary

This study has shown that the most attractive ways of producing 100 F-1 clear octane gasoline from low-octane virgin naphthas are:

1. The Iso-Plus process combining Houdriforming at moderate severity followed by thermal reforming of the reformate. (Case 4).

2. The Iso-Plus process combining Houdriforming at moderate severity, aromatics separation, and separate Houdriforming of the paraffinic concentrate. (Case 2).

The Iso-Plus processing scheme including thermal reforming is the most attractive economically.

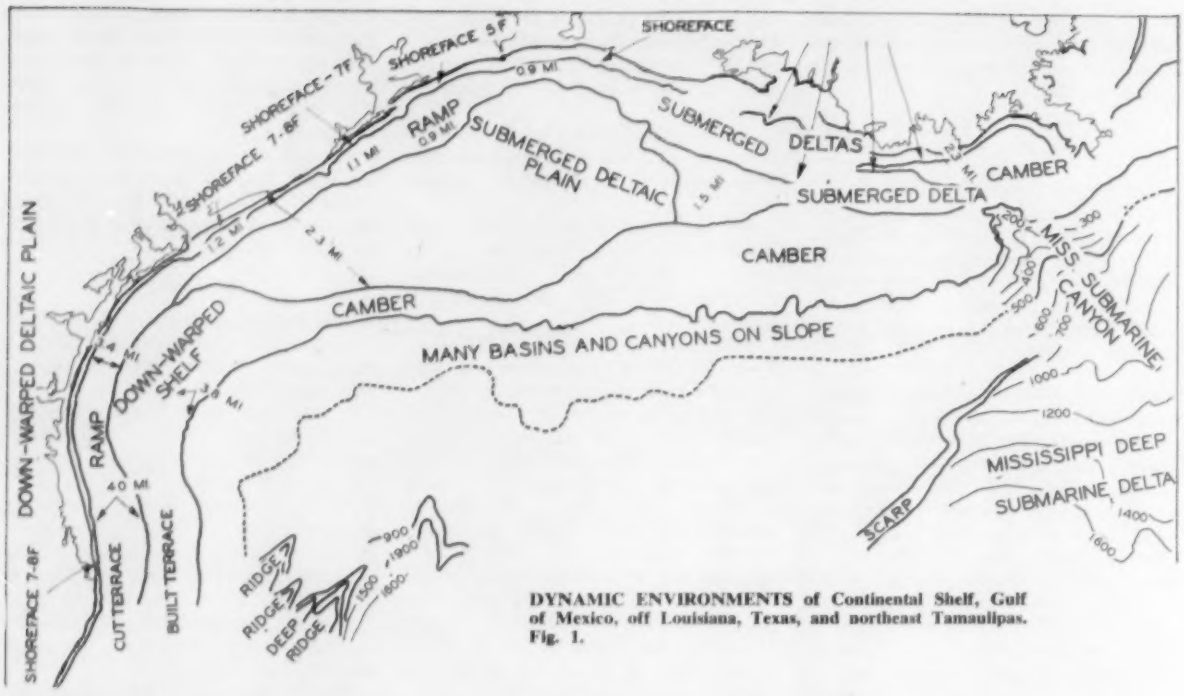
The Iso-Plus processing scheme involving aromatics separation has the highest potential for both octane and yield of motor gasoline.

Motor gasolines of the high-octane levels required today and in the foreseeable future may be produced economically by Iso-Plus processing schemes incorporating continuous nonregenerative Houdriforming.

TABLE 3—SUMMARY OF ECONOMICS FOR PRODUCTION OF 100 F-1 CLEAR OCTANE GASOLINE
(All quantities on a calendar day basis)

	Case 1			Case 2			Case 3			Case 4		
Credits—	$/bbl.	B./D.	$/day	$/bbl.	B./D.	$/day	$/bbl.	B./D.	$/day	$/bbl.	B./D.	$/day
Fuel gas (F.O.E.)	1.80	853	1,535	1.80	650	1,170	1.80	744	1,339	1.80	830	1,494
Excess butane	2.10	138	290	2.10	—66	—139	2.10	41	86	2.10	—111	—233
10-lb. R.v.p. gasoline		5,004			5,447			5,228			5,155	
Tar										1.80	30	54
Total credits			1,825			1,031			1,425			1,315
Operating expense:												
Houdriforming		6,000	3,745		¶6,000	2,306		9,210	2,348		6,000	1,552
					§2,209							
Depentanizing					5,364	255		6,425	283			
Arosorbing					5,094	1,183		5,950	1,329			
Thermal reforming										0.172	5,360	922
Catalytic polymerization										1.41	298	421
Feed stock	3.36	6,000	20,160	3.36	6,000	20,160	3.36	6,000	20,160	3.36	6,000	20,160
Total operating expenses			23,905			23,904			24,120			23,055
Cost of 10-lb. R.v.p. 100 F-1 clear gasoline			22,080			22,873			22,695			21,740
Byproduct cost 100 octane:												
With feed at 8 cents per gal.			10.51			9.99			10.34			10.04
With feed at 9 cents per gal.			11.70			11.10			11.48			11.20
With feed at 10 cents per gal.			12.90			12.20			12.63			12.36
With feed at 11 cents per gal.			14.10			13.30			13.78			13.52
Investment (process equipment)			‡2,205,000			‡3,183,000			‡3,065,000			‡2,680,000
Catalyst inventory	*9.00	†118,000	1,062,000	*9.00	†35,800	322,200	*9.00	†40,200	361,800	*9.00	†26,200	235,800
Gel				0.30	310,000	93,000	0.30	363,000	108,900			
Total			$3,267,000			$3,598,200			$3,535,700			$2,915,800

*Dollars per pound. †Pounds. ‡Dollars. ¶First pass. §Second pass.



DYNAMIC ENVIRONMENTS of Continental Shelf, Gulf of Mexico, off Louisiana, Texas, and northeast Tamaulipas. Fig. 1.

A New Approach to Mapping the CONTINENTAL SHELF

Effort was to devise method of mapping the shelf on a regional basis that would provide a control for more detailed studies of bottom deposits

by W. Armstrong Price

IT is not yet feasible to make geomorphic or geologic maps of more than small parts of the Continental Shelf on the scale of county and state mapping used on land. We have tried to devise a method of mapping the shelf on a regional basis that would provide a control for more detailed studies of bottom deposits and contemporary processes using available data. Because the realm of the shelf is oceanographic, the approach and methods are in part those of shallow-water oceanography as it has been developing on the Gulf Coast in recent years. However, the Continental Shelf is a surface over which the sea has migrated during the Pleistocene and much or all of which was land for great periods of time not too long ago. Hence, it was appropriate to blend the oceanographic methods with those already found useful in regional reconnaissance of the Pleistocene plains on land. Maps for the northern Gulf are shown here (Figs. 1, 2).

The method adopted here is a combination of the two methods of approach described. In developing the desired control, much new information has come to light (Price 1953, 1954).

Early studies . . . Some years ago John Doering (1935) made a reconnaissance map of the deltaic plains of Louisiana and eastern Texas which marked a milestone in Gulf Coast Pleistocene interpretation and methods. It was, as usual in Pleistocene studies, partly geomorphic and partly stratigraphic. So far, stratigraphic information is not available for the shallow formations on the shelf of the Gulf of Mexico.

Doering found that each master stream had formed a series of partly overlapping deltas of different ages. The depositional gradient of a delta surface was closely related to the grain sizes of the sediments and the runoff, sediment load, and gradient of the stream as it approached the delta. Thus, the depositional gradient of a Pleistocene stream could be determined from that of a present stream provided the grain sizes of the sediments and the runoff and sediment volumes were comparable.

Subtracting the depositional gradient from the present gradient of the delta gives the amount of the subsequent working. Doering's topographic maps showed the outlines, convexities, gradients, and gulfward tilt of the offlapping deltas. They also showed progressive uptilt inland from younger to older deltas. Extension of this mapping to

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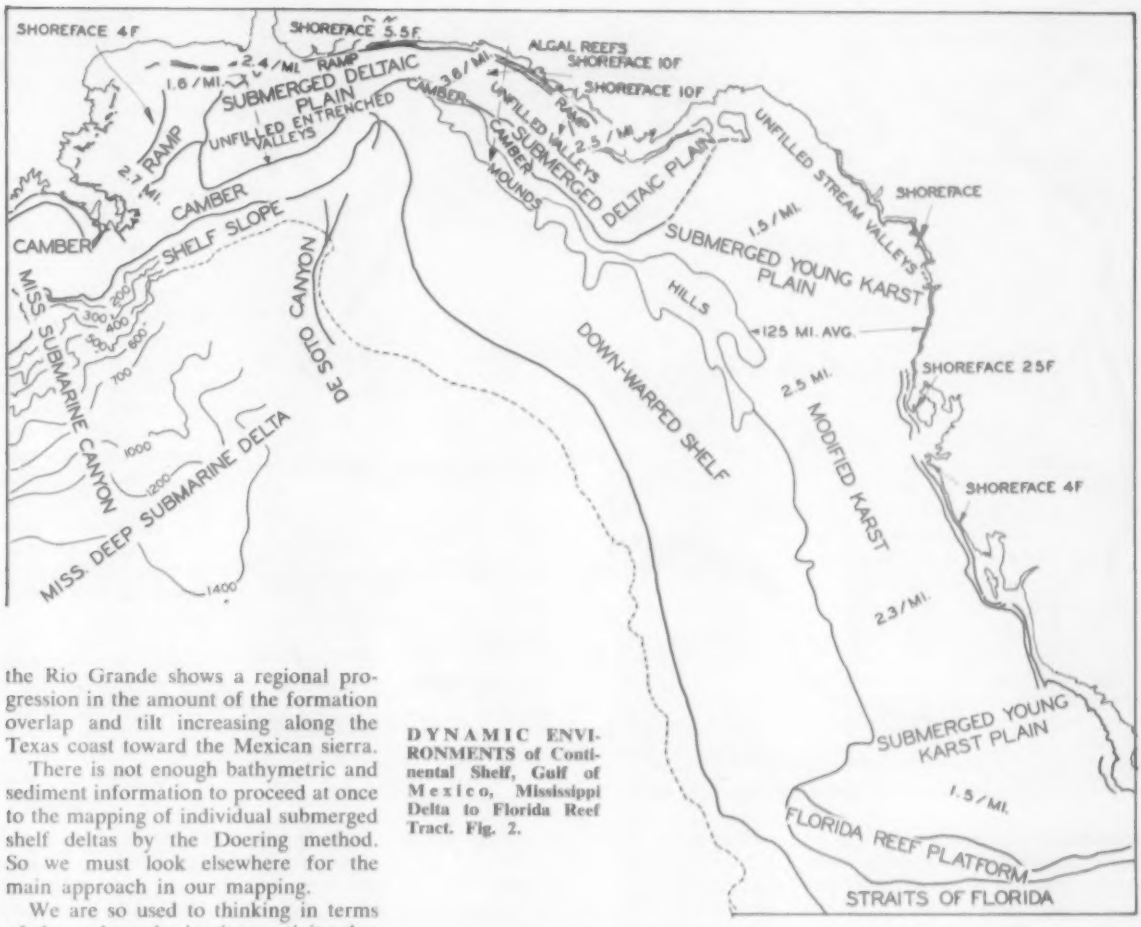


DYNAMIC ENVIRONMENTS of Continental Shelf, Gulf of Mexico, Mississippi Delta to Florida Reef Tract. Fig. 2.

the Rio Grande shows a regional progression in the amount of the formation overlap and tilt increasing along the Texas coast toward the Mexican sierra.

There is not enough bathymetric and sediment information to proceed at once to the mapping of individual submerged shelf deltas by the Doering method. So we must look elsewhere for the main approach in our mapping.

We are so used to thinking in terms of the end results in river activity that we do not often ask what makes a river behave as it does. Actually, it is the potential energy of the water in the upper reaches of a river that powers its flow to its mouth and controls sedimentation, erosion, and grading. The gravitational difference (potential energy difference) between upstream and downstream waters is the basis of the action.

On the Continental Shelf, waves, tides, and currents replace river flow as agents of erosion and the distribution of sediment loads. The energy that powers the waves and most of the stronger currents comes from the wind. Winds blow in definite regional systems that have been charted. The energy on different coasts differs because of variations in the wind systems, and the exposure of the coast to them. The general movements of the waves are charted from the known winds. The energy directed toward particular shelf sectors and shorelines may be computed from the wave systems. (C. L. Bretschneider, 1954; W. C. Thompson, 1954). Such general energy values might be used that would be found to harmonize with the major coastal developments without having to make slow, expensive energy determinations based on detailed direct observation of waves.

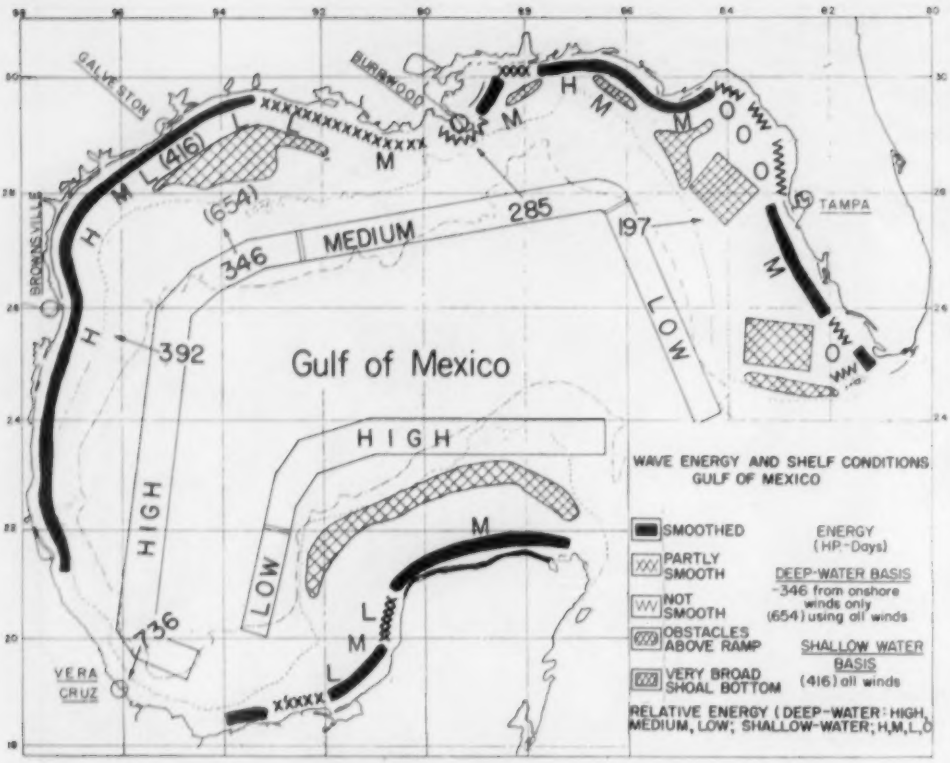
However, this energy approach would not be expected to yield geological information of value unless there were some sign that the wave systems were actually controlling or strongly influencing the form of the bottom and the distribution of sediments.

Profiles built . . . The obvious answer to a search for evidences of a wave-energy control in the shaping of the Continental Shelf lies in the validity of the concept of the graded equilibrium profile of the Continental Shelf. This concept is old, but its value in practical geological studies has been debated (Ph. H. Kuenen, 1950). To find out whether the present stillstand of the sea has lasted long enough to develop a profile of equilibrium in the materials of the Continental Shelf of the Gulf of Mexico, we drew a number of profiles from navigation charts and original hydrographic surveys.

Some of the results are shown here. These selected examples (Figs. 7-10) show that the equilibrium profile is a reality and that it is developed to different extents on different parts of the shelf. This last discovery is far more important for our purpose than if there were a perfectly developed profile on every part. Because we find the profile of equilibrium to be now in process of development on most of the coast, (Figs. 4, 6) the stage of development existing on a shelf sector is a measure of the interaction between the energy of the waves, the resistance of the bottom, and the rate of sedimentation during the period of stillstand of sea level

Not only is the degree to which the equilibrium profile has been developed across a sector of the shelf useful, but a comparison of curves shows a very striking contrast in the steepness of the profile on different coasts (Fig. 4). This contrast in steepness correlates with (1) the more evident major contrasts in the strength of the winds that blow toward the different sectors, and (2) the recency of deltaic advance. Thus we may use wave energy contrasts in relation to the steepness of the offshore bottom profile.

Equilibrium profile of shelf used in mapping . . . Analysis of the ideal equilibrium profile of the shelf (Fig. 6)

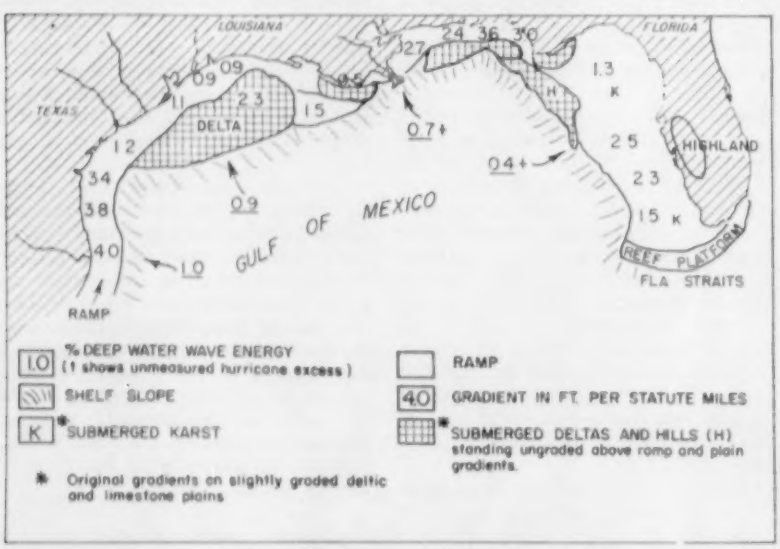


WAVE ENERGY and shelf conditions, Gulf of Mexico. Fig. 3.

shows it to consist of three parts: (1) a relatively steep but short concave **shoreface,** (2) a long but gently sloping **ramp** surface, comprising (when fully developed) most of the shelf, and (3) a convex terminal shoulder which is here called the **camber.** These new terms have been selected to avoid previous terminology differently or loosely used.

This study shows that it is feasible to map slope-and-curvature belts, shoreface, ramp, and camber, parallel with the general trend of the shoreline and shelf margin. By drawing energy sectors across these slope zones, a checkerboard is formed which defines many individual dynamic marine environments (Figs. 3, 4).

These environments have then been further analyzed to include as many



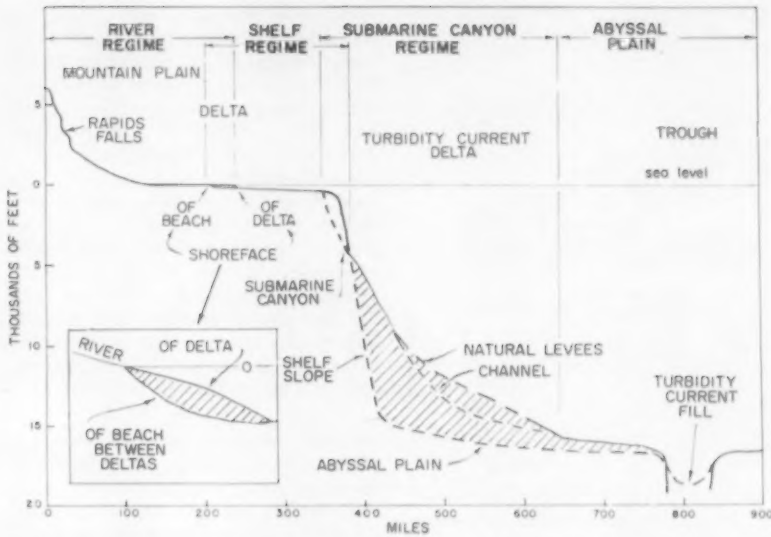
RELATION of energy, obstacles, original gradients, and lithology of bottom to gradients of ramp and submerged land surfaces of Continental Shelf. Fig. 4.

factors and conditions as were found to be definitely involved in determining the general conditions. In the study of the other factors it has been found that about five are fundamental in Continental Shelf development. These factors have joined with energy in helping to determine the shape and stage of development of the profile of equilibrium off different coastal sectors.

Very early in the study it was seen that on the hard limestone shelves the value of the energy has been so low and the rock so hard that marine forces seem to have been unable to reshape them very much. In fact with the low energy of these lee coasts, the existing slopes are close to the profiles that should develop in less-resistant materials.

Basic factors in the development of the coast and Continental Shelf . . . Earlier, the basic factors of the development of the Continental Shelf, shoreline, and coastal zone were analyzed by the writer as: time, energy, bottom conditions, sediment supply, climate and organic growths.

- **Time:** length of period that sea has stood at present elevation. If it previously halted at the same level, the older still can be added, provided there are still evidences of the bathymetry of the older periods. Time is reduced to zero by any sea-level change.
- **Energy:** mechanical energy of wave motion, which is basic factor in current action and cause of erosion, transportation, and deposition. Tidal and other currents may be analyzed under this head. Tides may transversely indent coasts not protected by beach ridges or bars. Strong wave attack tends to produce a longshore drift and build protective shore structures. Hence tide and wave forces act differently and their energy values cannot be merely added.
- **Bottom conditions:** bathymetry, lithology, and bottom gradients with areal distribution of different slope elements.
- **Sediment supply:** volume of sediment in transport (a charge against energy), forms of deposits made, and abrasive action of resistant particles.



THE THREE hydrologic regimes of sediment, transport, and erosion. True proportions shown diagrammatically. Fig. 5.

● **Climate** affects and partly controls meteorological factors; also weathering, plant cover, runoff and ground-water condition of hinterland. It affects the marine organisms, though mainly on the broad zonal basis of arctic, temperate, and tropical environments.

● **Organic growths:** growth of reefs and swamps with stabilizing plants and animals that protect the shore, the retarding effect of organisms on currents and their tendency to trap sediment and interfere with wave motion, their alteration of the bottom by developing massive or encrusting growths (including reefs) which again affect waves and cause bottom friction.

Some factors that we usually emphasize separately are included under the basic factors just listed. Thus, tectonic deformation acts on shorelines and the shelf to change depths and bottom conditions and alter the time factor by changing the relation between sea level, shoreline, and shelf bottom. Uplift or depression of a shore zone renders the time factor zero and starts a new development cycle.

Values of any one factor may be determined for a shelf or shoreline sector by comparison. Two sectors are found in which, ideally, all but one of the basic factors are essentially the same. There are pitfalls in interpretation when, as is usually the case, this is not strictly true.

The energy factor is prominently used here as it can be given numerical or relative values more readily and simply than others. It is possible to compare the effects of variations in a factor because there are many long coastal sectors where several factors remain essentially constant, with readily noted local maxima and minima.

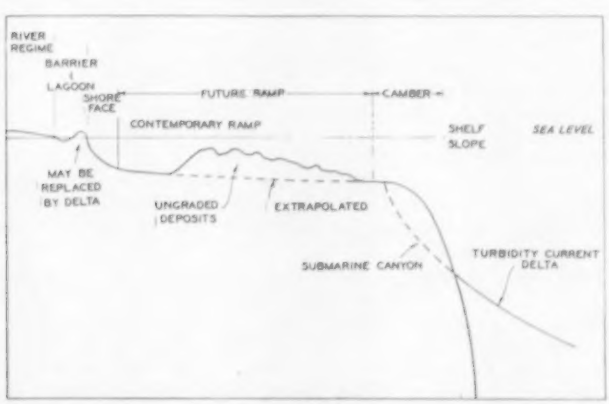
A major aim of oceanography is to derive mathematical interpretations for natural phenomena; that is, to treat them quantitatively. Not all the basic factors listed may readily be given numerical values with a useful meaning. Methods of combining them (formulas) may be hard to devise and the results may be obscure. The bottom-condition factor is partly represented here by comparison of numerical values of gradients. Tidal range may be given numerically and some comparison made between currents by comparing the range in their speeds and directions, using exponential values.

To the geologist, this multiplicity of numerical factors and physical processes (so readily understood by the physical oceanographer) may seem formidable. Luckily, as in his previous experience with the earth, the geologist finds that the important results come out in round figures and in the large two-dimensional and three-dimensional effects that he knows well. Results so far show that the same factors and methods of study apply to some of the more detailed aspects of marine geology as in sedimentation and paleontology.

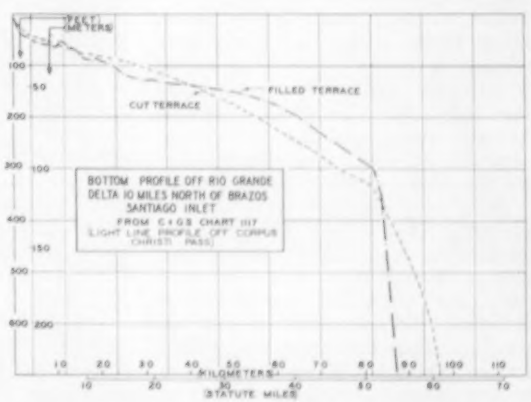
Another aim of oceanography is to correlate the data of all phases of oceanographic science when considering environments, processes, and boundary conditions. In this study, meteorological and physical data are basically used. Biological factors are also used, and a number of points of liaison with chemical oceanography were found.

Mapping the dynamic environments . . . The longitudinal belts mapped around the Gulf of Mexico are the shoreface, ramp, and camber, Figs. 1 and 2. Crossing these belts at right angles are the boundaries between the well-known carbonate environments of the peninsula of Florida and Yucatan and the sand-and-clay environment which covers the rest of the shelf mapped. For lack of bathymetric data, the fairly narrow shelf in Mexico between the Rio Grande Delta and the base of the Yucatan peninsula is not mapped.

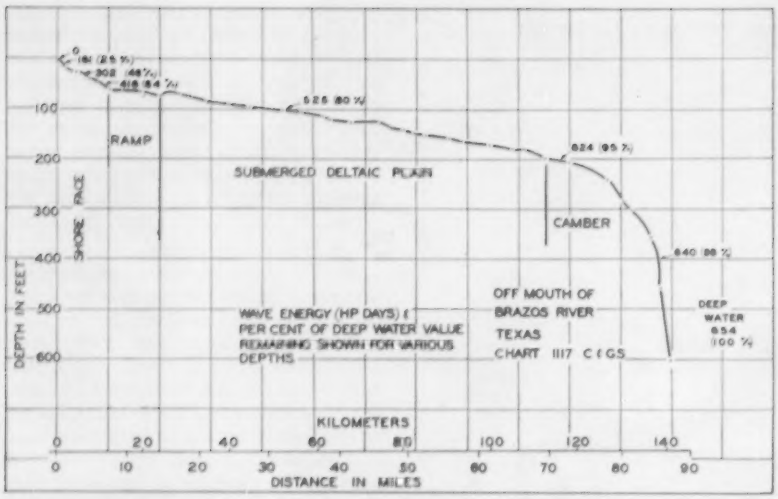
Subdivision of the two major sedimentary environments (carbonate and



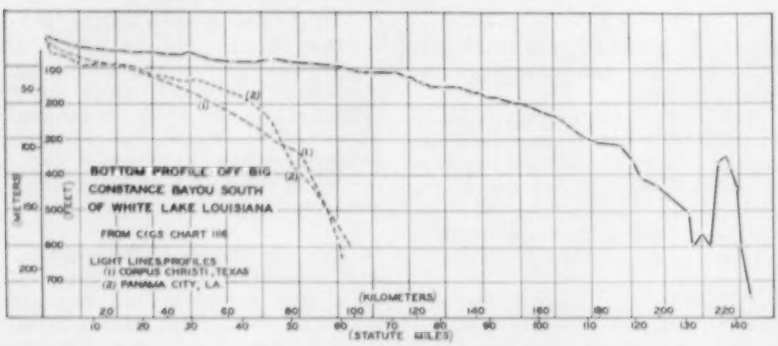
DIAGRAMMATIC bottom profile of Continental Shelf. Fig. 6.



BOTTOM PROFILE off Rio Grande Delta, 10 miles north of Brazos Santiago inlet. Fig. 7.



BOTTOM PROFILE off mouth of Brazos River, Texas. With Bretschneider wave-energy values. Fig. 8.



BOTTOM PROFILE off Big Constance Bayou, south of White Lake, Louisiana. Fig. 9.

sand-and-clay) is made on the basis of energy. Relative energy values based on the wind paths and some bathymetric and shoreline effects were used first. The relative energy ratings assigned were then tested by numerical data and found to be of the correct order of succession from low to high (Fig. 3).

The western coasts of the great, broad limestone peninsulas are low-energy, lee coasts. They have sectors with slightly increased energy where the shelf is slightly steeper than the average, and also sectors with zero energy (geologically speaking) where the bottoms are exceptionally gently sloping (Fig. 4).

Because of diagonal winds and the sheltering effect of the Florida peninsula the northeastern Gulf Coast has medium energy. Exceptions occur locally where the shelf is narrow and the camber close to shore. The northwestern gulf has diagonal winds and protruding deltaic masses. These conditions give medium to low energy. Variations are due to variations in shallowness of the deltaic bottom.

High wave energy is found on the western coast south of the Brazos-Colorado Delta, Texas, and on the north coast of the Yucatan peninsula.

Low-Energy, Lee Coasts

The diagrammatic maps, Figs. 3 and 4, show the approximate boundaries of the major energy sectors based on the wind systems and related shoreline and bottom conditions. These are the offshore, gross energy values. Variations in depth of water in the shallow parts of the shelf modify gross energy. Values are given also for the effective or net energy of the waves in shallow water. The net energy is that left over and above frictional losses on the deep parts of the shelf. The net energy variations are expressed in the varying rates of slope of the ramp from sector to sector (Fig. 4).

The figures for wave energy in this report are—except along one profile—those of the wave trains that move toward shore; the onshore wave systems. Further computations now in progress will consider (for selected shoreline stations with adequate wind data) the waves generated locally on the shelf by winds blowing in any and all directions. So far the swells, or waves from distant storms, have not been considered for lack of data. They are a minor factor because the gulf is landlocked.

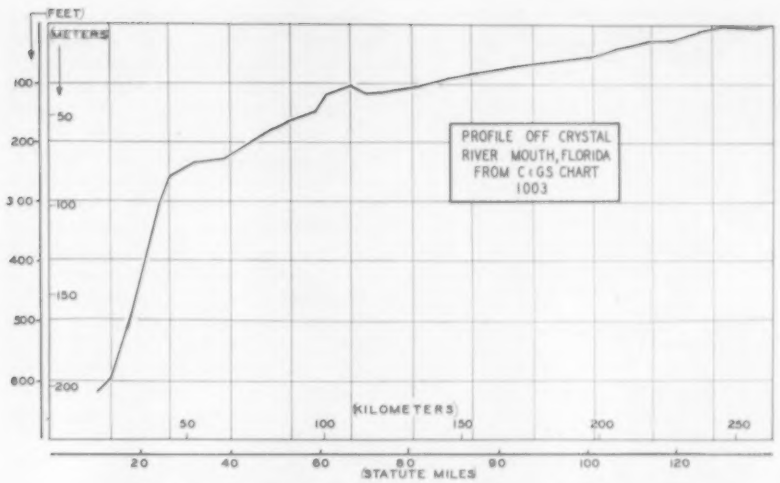
Large environmental areas on the shelf, here called obstacles, are areas of bottom that stand up well above the projected gradient of the ideal profile of equilibrium (Fig. 6). These are elevations met by the sea as it rose from the last glacial lowering and not yet removed by erosion. The obstacles are old deltas, reefs, salt dome mounds, and various unexplored mounds.

Dynamic nature of study . . . As in other fields of geology, in the realm of the Continental Shelf nothing is static. For example, we must consider the factor of time to be constant for any sector where—in spite of minor sea-level variations—the development does not seem to have been markedly discontinuous and where the characteristics are not due to an alternation of markedly different conditions. Development is a progressive action and, in a dynamic environment, the conditions vary about a mean.

Again, in the medium or low-energy environment of a deltaic coast, the ramp was not at first as broad nor as steep as it now is. For a prograding shoreline, we do not need to trace all the intermediate steps of erosion and sedimentation to understand the present shape, provided the variations did not depart too much from the mean.

Thus, the dynamic environments must be regarded as in process of development. It should be our task to find out whether the forces and the inert bodies involved have or have not reached a dynamic equilibrium and to recognize when this equilibrium may become broken down. Hence, each environment mapped should be regarded as having variations around the mean. It is the mean which we try to describe, but we should also know the probable range of the variations, and the time periods of the oscillations.

Reconnaissance nature of study . . . This paper gives early results of the first try at mapping the Continental Shelf by slope zones and sedimentation and energy sectors. The maps on the coast-chart base (Figs. 1 and 2) have not been refined. For example, the contact lines between the zones use the navigation sheets, not the full hydrographic survey data. Second, multiple "ramps" shown include some which were probably cut at low sea levels. They lie off shoals with what seem to be submerged former shorefaces. Some trough-shaped depressions shown are



BOTTOM PROFILE off mouth of Crystal River, Florida. Fig. 10.

not properly ramps. Close analysis of these minor features has not been attempted for these maps.

Geological Results

Geological results will not be discussed in full here. In dating submerged and emerged features, it has been possible to map and list (a) sedimentary structures and erosional surfaces of the contemporary stillstand period such as: beaches, barriers, prograded deltas, prograding mangrove swamp, submerged young deltas, shallow coral-reef platforms, and the Rio Grande Delta cut-and-fill terrace (Fig. 7), and (b) known and probable sedimentary structures of the prelast-entrenchment period such as: submerged entrenched deltaic plains, coral reef platforms with deep-based reefs and atolls, and (c) emerged fossil features, including barrier islands, spits, marine plains, lagoonal plains, and shoreline notches and nips.

Comparison of shoreline features of the large Mississippi and tiny Rio San Fernando (or Rio Conchos, Tamps., Mexico) deltas strongly suggests that rapid local consolidation of water-soaked clay and silt deposits, not deep-seated warping, is mainly responsible for the rapid submergence of at least the smaller lately abandoned, deltaic interdistributary plains. Some, at least, of the larger of the sandy deltaic sedimentary structures (barriers and levees) remain at the present sea level for many centuries (as north and northeast of Grand Isle, La.) rising well above adjacent lowered clay plains.

Rapid sedimentation of the bottom of the gulf basin is suggested by the great volume of the deep Mississippi Delta (13,000 sq. miles) and the conclusions of Ewing and associates on the large scale of turbidity-current deposition in the western North Atlantic.

Conclusions

1. Analysis of shelf geology by dynamic environments of the Gulf of Mexico (1) outlines areas of contrasts in geomorphology, distribution of contemporary sediments, degree of exposure or lack of exposure of older strata and degrees of modification of submerged land surfaces, and (2) also yields data on the equilibria controlling the marine activities and histories of the contrasting areas.

2. More than a dozen major and numerous minor dynamic environments are mapped in which the geological and oceanographic features have distinctive characteristics and contrasts.

3. The maps and data resulting from this analysis provide basic information for further, more detailed, bottom and shoreline studies.

4. In defining the environments, the following intersecting zones and sectors delimit an irregular checkerboard:

A. Longitudinal zones of unequal width, based on differences in slope of component parts of the shelf-bottom profile of equilibrium; (a) the concave shoreface, (b) the gently sloping, nearly plane, ramp, and (c) the convex, outer, end-dump shoulder, or camber, with (d) ungraded areas elevated above the profile (residuals of drowned land topography).

B. Transverse zones based on (a) wave-energy values (relative and numerical), (b) associated variations in slope of the profile zones listed under A as a, b, and c, (c) major sediment and bottom types (carbonate, sand-and-clay), and (d) major climatic realms (tropical, extra-tropical).

5. High wave energy is correlated here with (a) smooth shorelines with barrier islands and broad, blunted deltas; (b) well graded bottoms; (c) the broader and steeper shorefaces which are sandy to bottom, with large sand bars; (d) the steeper ramp developments; (e) erosional areas lacking contemporary sediments at upper termination of ramp; (f) sand and clay on the ramp whose distribution is not well known; (g) a very broad downcurving of the outer shelf, possibly in part down warped, but with camber-type clays, and (h) presence of submarine canyons.

6. Medium wave energy is correlated here with (a) moderate smoothing of shorelines; (b) poor alignment of smoothed sectors, with numerous changes from medium to low energy; (c) deposition by large rivers; (d) fine-grained sediments in many places close to shore, including occurrences on the shoreface; (e) narrower and shallower shorefaces; (f) gently sloping ramps; (g) narrow and well defined cambers; and (h) presence of submarine canyons.

7. Low energy sectors include and low energy correlates here with: (a) lee shores, reentrants, and shores behind broad shoals and submerged deltas; (b) nearly nondepositional, limestone bottoms where the shelf is nearly flat on lee, low-energy, deltaless peninsular shores; (c) belts of organic sands with detrital sand near shore in which, as far as known, the grain size grading is not progressive in the transverse direction; (d) transversely tide-scoured coasts in marsh and drowned karst; (e) mangrove swamp belts along marine coasts in tropical regions where clay-carrying currents bathe the shoreline; (f) unfilled submerged stream valleys on bottoms of low to medium energy away from heavy deltaic sedimentation; (g) seeming absence of submarine canyons on limestone shelves.

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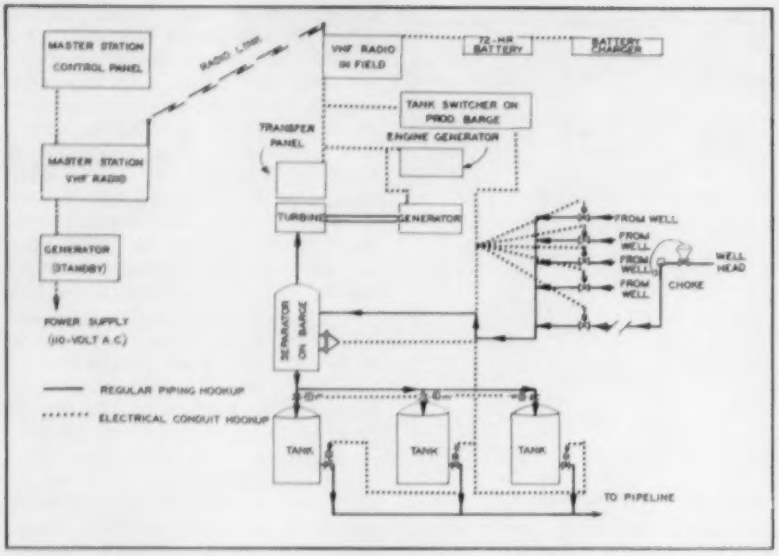


THE REMOTE RADIO CIRCUIT connecting the offshore Timbalier Bay field and the onshore control station is shown in the above schematic drawing.

How Gulf equipped Timbalier Bay field for remotely

Controlling Production by Radio

THE day when completely automatic operation of an oil field in an inaccessible area can be carried on successfully and dependably from a remote point has moved a big step nearer. Gulf Refining Co. is operating radio-controlled automatic producing facilities at Timbalier Bay field.

This remote-control system, which has worked well so far, promises widespread adoption for offshore use. It could be especially helpful in future producing areas 35 to 70 miles from land.

The advantages of having such an automatic setup, controlled by VHF radio, are readily apparent. Such a system would reduce manpower needed, save money, and permit many routine chores of the pumper to be carried out in hard-to-get-to places, in any kind of weather—all automatically.

Experimental . . . Gulf Refining Co.'s present facilities at Timbalier Bay are purely experimental. Minor difficulties have shown up, but none of them have been very significant. Gulf feels that with a few equipment modifications and some system refinements, this radio-directed, remote-control operation can answer many of the problems facing offshore producers today.

Under the experimental setup, a pumper at the main base camp can push buttons on a control panel and send VHF radio signals which:

. . . Open electrically operated motor valves on the flow lines of the wells in the field to start the wells flowing into storage tanks. Wells are controlled as a group.

. . . Close the same valves by pushing another button.

. . . Check field conditions; i.e., find out if the system is operating properly by running a check which tells him, by indicating lights on his desk panel, if the wells are flowing, which tanks are full, which are empty or filling, and if his power supply is functioning normally.

Early history . . . The remote-control operation at Timbalier Bay is quite similar to other automatic-control systems. It differs mainly in that radio transmits signals to trip electrical microswitches and activate the various motor valves.

The biggest incentive to speed up automatic production's progress has been the oil found in almost inaccessible shallow-water bays and offshore in the tidelands. Gulf therefore set up an "automatic control system" in 1952 at Weeks Island field in Iberia Parish to study the practical aspects of such a venture.

Pressure-operated diaphragm-type valves were installed on each well. These valves were controlled by a bourdon-tube-type pilot with a high-low shutoff. Fabricated drips or scrubbers were located downstream from the valve to provide the operating gas. Electrically opening or closing a valve on the tank-battery manifold causes flow-line pressure to rise or fall. If the line pressure rises, it operates the diaphragm-type valves at the well head. This closes the particular well which corresponds to the electric valve on the manifold.

Similar electrically operated valves were installed on all tank-filling lines. Such valves, working with a float switch, electrically direct oil into a given tank and determine when each tank is full. There is a safeguard to prevent direction of the oil into a tank making a pipeline run. It's a "limit switch," incorporated into the tank discharge or pipeline valve.

Switcher . . . The heart of the automatic producing system is the tank switcher which actually controls, supervises, and directs the various components of the automatic system. The switcher not only gathers and directs all information, but also puts into operation all of the various facilities to switch tanks and supervise the over-all operation.

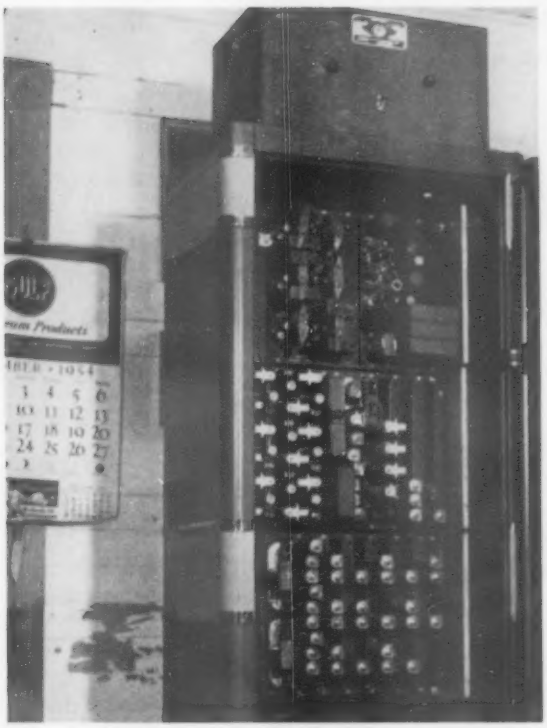
Essentially a rotary switch, the switcher is actuated in sequence by the float switch in each tank. If a certain tank fills up, its float switch relays the data to the tank switcher. The latter deenergizes the electric valve on the tank-filling line, then rotates to the next tank and energizes the valve on its tank-filling line. If this particular tank has already been filled, the float switch will indicate this to the tank switcher. It then passes over this tank and on to the next empty one. If a tank is on a pipeline run, the same action takes place.

In the lease shack, the picture of tank conditions is shown on an indicating panel by colored lights. On-off switches and interposing relays allow the lease to be produced unattended, automatically. The pumper's occasional glance at the control panel tells him the status of not only the wells, but of the whole tank and production system.

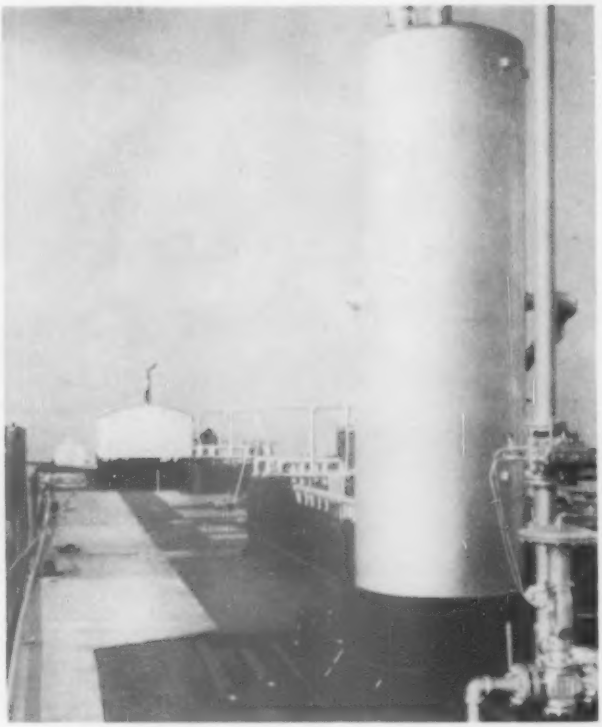
Remote Controls Devised

When Gulf was satisfied that its Weeks Island automatic-production setup was working well, attention turned to the possibility of adding remote control.

An installation was set up at Timbalier Bay field, which is located in shallow water close to the mainland of South Louisiana. The automatic controls for this production installation have the same basic design as other automatic production controls. So it isn't



RADIO EQUIPMENT at the main onshore station includes this rack-mounted supervisory control installation.



THIS PRODUCTION BARGE carries the radio-controlled automatic production facilities which are operated from the main station.

the automatic production setup in itself that is unusual. It's the combination of this setup plus remote controls operated through VHF-radio link. If such a combination were perfected, it would greatly increase the value of automatic-production setups in offshore locations because transportation and labor costs could be greatly reduced.

The experimental equipment was installed on State Lease 1772. It consists of an oil-storage barge, main-camp radio facilities, and necessary components of the production system.

Equipment . . . In the first installation, 11 wells flow into a single barge. The wells are automatically and remotely controlled from a radio panel at the main camp site. The barge is fitted with the tank switcher and contains float switches for each storage compartment, plus the various electrically operated valves and their manifolding. The result is a complete automatic system similar to that installed on land.

The VHF radio and multiplexing equipment relays details of production conditions to the master control at the main camp 2 miles away. Additional control is also available to do such normal physical operations as opening and closing the valves.

Electricity is supplied during normal operation by a 5-kw. turbine generator powered by gas pressure. When the wells are shut down and there is no natural gas available for the turbine, a standby engine generator automatically takes over to maintain power. Should the generator fail, a 72-hour storage battery is supplied which can carry the startup load. Gulf plans to use the battery for power during severe storms.

How radio control works . . . The two radio stations (one at the main control station at camp and the other near the tank-battery barge in the field) operate over a duplex VHF radio channel in the 72-76-meg. band. The master station transmits orders on one frequency, and the control barge relays the production data back to camp on another.

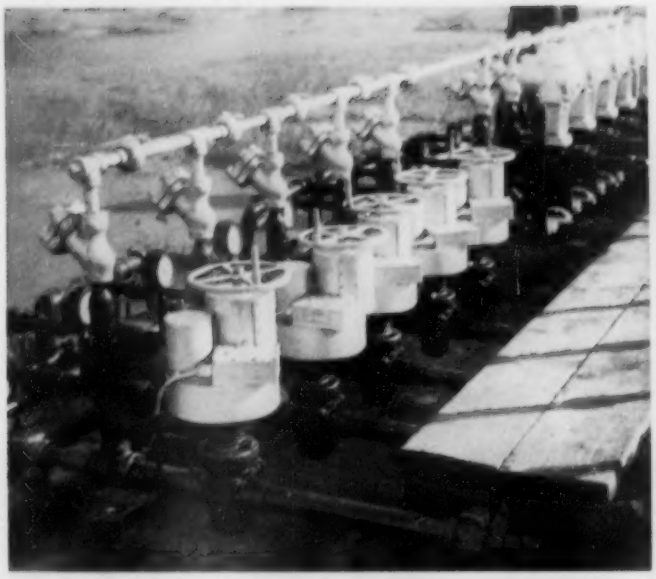
SUPERVISORY control console has individual point escutcheons on the top row and the master control keys on the bottom row.

Where there are a number of satellite stations reporting to the master station (as there would be if several tank batteries were operated over the same system), interference between the automatically reporting remote stations could be avoided by providing the satellites with a means of "storing" their data should they be locked off by the transmission of another station. Then once the frequency was clear, each station would automatically report its data to the main camp in a predetermined sequence.

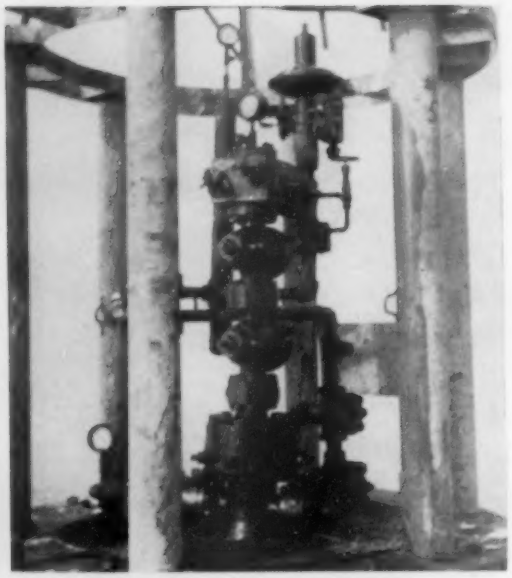
Tone signals in sequence report intelligence for the remote control of the barge in the field. The 72-76-meg. VHF, unlike microwave, permits omnidirectional transmission and so cuts costs where several satellite stations are controlled from one master station.

A series of audio tone pulses which modulate the VHF carrier have been assigned to each control function or indication. Thus the reception of a coded tone closes resonated relays which cause either opening or closing of valves or lighting indicating lights on the control panel.

Master station . . . Indicating lights and various control buttons are located on a desk-top console at the master station. As already pointed out, the various lights indicate if a tank is full, empty,



MOTOR VALVES like these on the production barge are actuated by electricity and controlled by impulses transmitted by radio.



THIS WELL-HEAD HOOKUP has electrically operated, radio-controlled motor valves which open and close the wells.

or filling, or if wells are flowing of shut in. On-off indications are shown for the turbine generator, the engine generator, the breaker controlling power to the electric motor valves on the wells, the separator high-liquid-level alarm, and the full-storage alarm. If the radio and remote-indication part of system fail, automatic controls at the barge go right on producing oil until all of the barge's storage compartments are completely full. If trouble occurs in the production equipment itself, wells automatically shut down.

Once activated by remote control, the production setup is completely automatic. It operates independently, but the remote-control facilities permit the operator to assume complete control himself if he so desires.

How the system works . . . Now to follow through an automatic, remote-controlled cycle of the producing system as installed on the barge at Timbalier Bay. The schematic drawing accompanying this article shows a simplified tank battery. Assume that the battery is shut down and all of the wells are shut in. The entire tank battery, in the following description, will be placed in operation merely by pushing buttons.

Assume you are the lease pumper sitting at your desk at the main camp 2 miles from the tank battery. You want to put your wells on production. Here's what you'd do:

1. Push the "start" button on your control panel. Immediately, the radio will transmit a signal out to the building where the gasoline standby engine generator is located. The engine generator starts up to supply the power for your control system. After the radio equipment out in the field has warmed up, you . . . .

2. Punch a "check" button on your panel. This will run a complete check on the system, including all of the supervised functions. Quickly, through flashing colored lights and corresponding tone signals from the radio, you get a clear picture of the status of your field.

3. After you've run your check, you reset the control panel. This action quickly brings all flashing lights to a "steady" condition. The facilities are now waiting, actually anticipating your next move. Now the indicator light for your standby generator is green, showing that you have electric power available and can go ahead with your start-up procedure.

4. Now you select the control function of starting the wells flowing. You press a "wells open" button. Radio tones tell you that the operation has taken place. As soon as the wells are flowing by means of supervisory control, the turbine generator which runs from the produced gas automatically replaces the standby generator as the power source. You're told that this has occurred by the indicating lights on your panel.

It isn't necessary to switch tanks, since this is done automatically by the equipment at the barge. But an indication of the condition of each tank is furnished by supervisory lights on the panel. Therefore, as long as tanks are switched and operating normally, the supervisory control system lights the proper indicators.

If an undesirable condition arises (i.e., if one of the tanks becomes full or the fluid level rises above a desired level in one of your separators), the wells will automatically shut down. This too will be shown on the panel.

Similarly, all control and supervisory duties are performed for the switches, giving you complete control and supervision of the producing conditions at the tank battery itself.

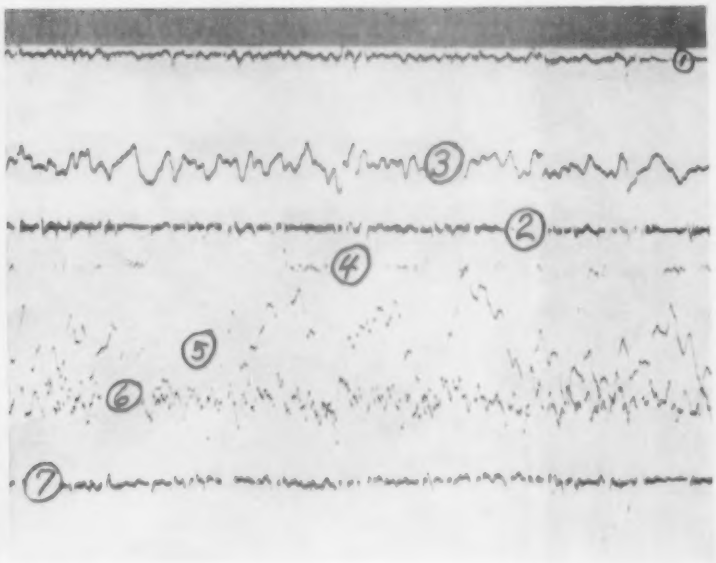
The supervisory equipment on the barge is not energized when shut down. But a radio receiver with a special tone-operated start function is on standby operation from the storage battery.

Not practical close in . . . Costs of such facilities for a field like Timbalier Bay, which itself is relatively accessible for regular short-haul transport of personnel, would likely be uneconomical. That's why Gulf emphasizes that its Timbalier Bay facilities are for experimental purposes only. The facilities were installed for observation by engineers and production personnel so they can tell just how such a system would function on an offshore platform 50 to 70 miles away.

Total radio equipment for this experimental setup cost approximately $27,500. The base station itself cost $19,000, but it would be capable of handling any number of other stations costing approximately $8,500 each.

Acknowledgment

Appreciation is expressed for the assistance from Gulf Oil Corp., and from C. R. Bayless and J. W. Daughtrey, Gulf Oil, Houston, in the preparation of this article.



Here's a tool that lets you see What Goes on Below

It has long been a mystery what actually goes on down in the bottom of a drilling well. With the new tool described here, we will be able to find out what happens. There will be two important uses of this instrument. First, it will help us evaluate our drilling methods. It will also serve as a logging tool to tell us about the formations drilled.

by Carl R. Canfield

MANY devices have been used in an attempt to learn just what takes place beneath the surface of the earth while drilling operations are under way. However, in the past no known instrument has gone down the hole to record several variables simultaneously while drilling.

Author is manager of the instrument department, petromechanics division of Borg-Warner Corp., North Hollywood, Calif. Paper presented at Philadelphia meeting of Instrument Society of America.

Certainly, a many-channel recording oscillograph fitted to an oil-well drill would open new horizons in oil-well instrumentation. For greatest utility, the system should measure and record simultaneously as many as possible of these: stresses, pressures, temperatures, accelerations, impacts, vibrations, displacements, velocities, and time.

The nine-channel recording system developed by Borg-Warner Corp. makes it possible to correlate any one variable as a function of the others, or a total of 36 correlations. With this much information available, oil-well tooling and drilling techniques can be developed for much greater speed and efficiency than was heretofore possible.

How it's made . . . The basic elements of this recording system, as shown in Fig. 1, include a nine-channel recording oscillograph; a matching network

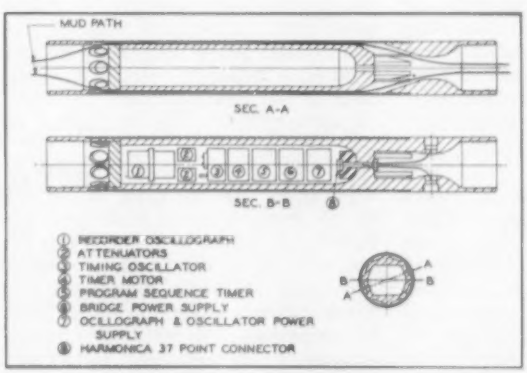


Fig. 1—The basic elements of Borg-Warner's new downhole instrument. It records as many as nine different variables.

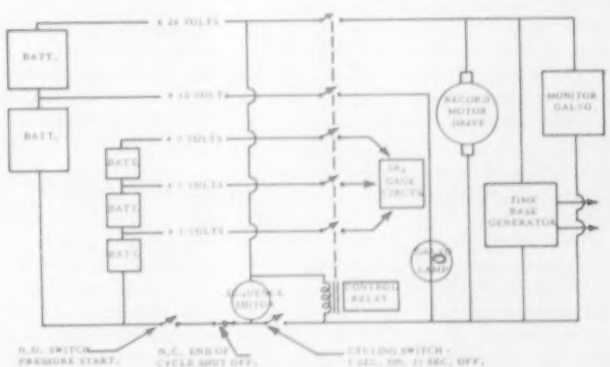


Fig. 2—Basic power supply and control circuit of the new tool. Some of the measurements will be mud pressure, torque, and compressive load on the bit.

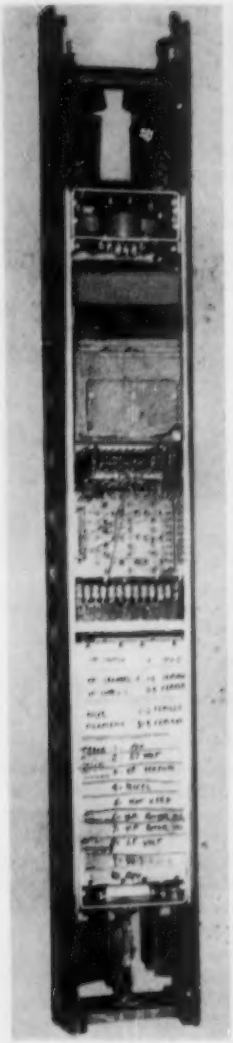
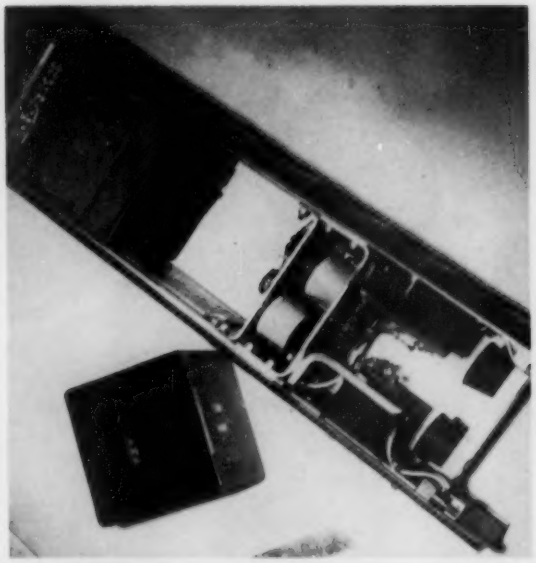


Fig. 3—Construction of instrument rack as used in tests.



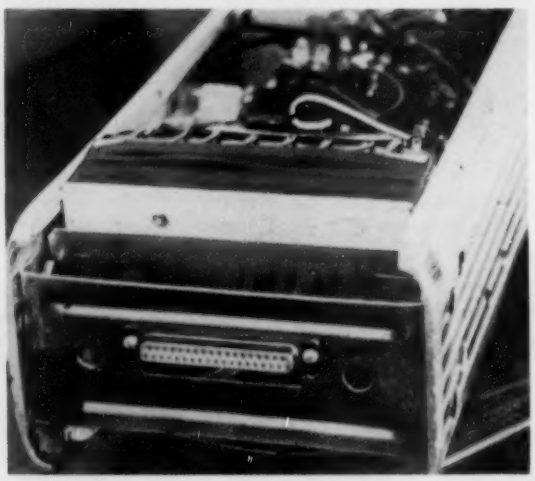


Fig. 4—(Above) The recorder is shock mounted to the instrument rack. Fig. 5—(Below) The 37-point receptacle at the base of the sub.

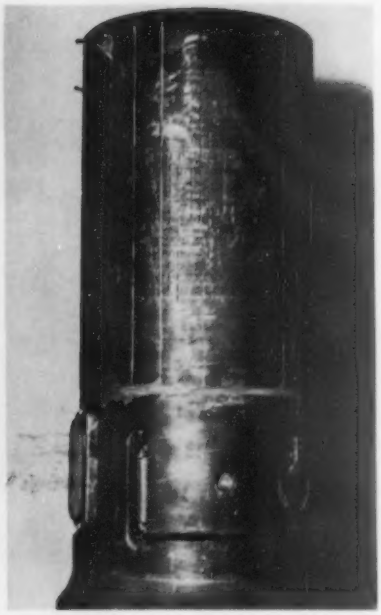


Fig. 6—Grooves down side of tool carry wires to instrument.

Fig. 7—The instrument cap. It carries such devices as velocity pickups.

for the integrating galvanometers; an oscillator to make timing marks at 1, .1, and .01 seconds; a nine-channel d.c. bridge balance; a program sequence timer; a power supply for the bridge of 3, 6, and 9 volts and a 24-volt d.c. power supply for the recorder and sequence timing motor. Fig. 2 outlines the basic power supply and control circuit.

The actual construction of the instrument rack as used in the tests is shown in Fig. 3.

The recorder is shock-mounted through its side flanges to the instrument rack, as shown in Fig. 4. The remaining equipment is mounted solid to the chassis rack. The end of the rack has a 37-point subminiature connector, which is mounted as shown in Fig. 5. Sliding the rack into place engages a 37-point receptacle at the base of the instrument sub. The d.c. bridge balance is made of 20-turn, 10,000-ohm, subminiature trimpots.

Power to the recorder and timing oscillator is supplied from silver wet cells with a capacity of 1 amp.-hour. Power for the bridge circuits is supplied from mercury cells. The 37-point subminiature connectors measure only ½-in. by 2½-in.

On the outside . . . The many wires servicing the nine-channel recorder run in narrow grooves milled down the length of the tool, as shown in Fig. 6. The wires used are KEL-F, insulated and potted in resin. The potting is carried to within 6 in. of the end of each section in the laboratory. Final makeup and potting of joints is done in the field after assembly on the rig. A special heater was constructed to cure the resin in a very few minutes.

The many incoming lines terminate at two 18-point plugs mounted at the end of the instrument sub. Eighteen wires from each of these plugs are carried through heavy neoprene tubing to a 37-point connector mounted at the base of the instrument sub. The end fittings of these plugs are potted in resin.

A separate 37-point receptacle is wired in parallel and fitted in the side of the instrument sub flush with the surface, as shown in Fig. 5. This receptacle has an O-ring sealed protective cover. With this receptacle, it is possible to make adjustments and carry on maintenance in the field, with the instrument rack removed from the sub.

Whenever possible, four active gage bridges are used. The output signal is fed directly into CEC galvanometers,

without the aid of amplification. Two channels contain integrating galvanometers for use with velocity pickups. A special matching network with attenuation in seven steps from 1 to 100 has been built in to accommodate each of these channels.

Many of the transducers are within the instrument cavity itself. Thus, we reduced the number of wires which must come through pressure sealed input lines to the sub. Such devices as velocity pickups mounted on the instrument cavity cap (shown in Fig. 7) can be used to measure vertical and rotary displacements. Pressure transducers mounted on the cap sense the downhole mud pressure. Pickups within the wall sense the pressure of the mud returning uphole.

The instrument sub mounts directly above the bit. This allows measurement of torque to the bit and compressive load on the bit by use of strain gages fixed directly to the substructure.

To get it started . . . The program sequence timer is initially started by use of a pressure-actuated switch mounted on the instrument cavity cap.

This switch is fitted with rupture disks which can be preset for a hydrostatic pressure corresponding to the working depth in the well, plus a safety margin of about 150 psi. When drilling starts, the surface mud pumps are surged. This causes downhole pressure to exceed the safety margin of the disk. The disk ruptures, closing the starting circuit.

There is a second switch (normally closed) which is in series with the first switch (as shown in Fig. 2). After a predetermined number of recording cycles, the switch opens, shutting down all circuits in the instrument.

The instrument sub itself has an instrument cavity about 5 in. square and 30 in. in length. The walls have tubular sections capable of carrying mud flow of 700 g.p.m. at pressures over 2,000 psi. This instrument sub has been designed for use at depths of 10,000 ft.

First test runs using this instrument sub were designed to evaluate this type of downhole instrumentation. Sample stresses were taken. Temperature, pressure, vibration, displacement, and velocity measurements were made. The illustrations at the beginning of the article show the complete instrument rack assembly being installed in the sub on the derrick floor, and a section of a typical downhole recording.

How it will be used . . . Currently, the application of this instrumentation will divide itself into two uses:

One will deal with measurements to bring better drills and better drilling techniques. Very accurate data on the actual drilling process can be obtained. Drilling techniques can then be modified so that they are most efficient. For instance, it is probable that the drilling rate will be determined by the actual amount of force with which the drill hits the formation. This is far different from the weight on bit as measured on the rig floor. Also, this measurement can be made over very short periods of time, and the effect of drilling mud pressure on this force can be readily found.

A much wider and possibly more important use of the instrumentation will be as a logging instrument. The instrument can be put on regular drilling strings and records taken out every time the bit is changed. Almost any type of record that would be of interest to the geologist or production man could be made each time the drill is in the hole. The speed of the paper going through the oscillograph can be changed so that many readings at short intervals can be taken. One might get, for instance, the hardness of the formation every 30 seconds.

Many problems remain in downhole instrumentation, but the tools with which to attack these problems are available. The tests run to date have proven that it is possible to deal with Mother Nature on her own terms and come up with answers to secrets she has held for centuries.

BOOKS

TYPE LOGS, NORTH BASIN PLATFORM AND CROCKET COUNTY, TEXAS. Available from West Texas Geological Society, Midland, Tex. Two sheets, scale 1-in. equals 100 ft.

The West Texas Geological Society has issued two composite electric logs that will be of value to petroleum geologists and engineers. One covers the pre-Mississippian section in Crockett County and adjacent areas; the other covers the pre-Mississippian section of the North Basin Platform in Crockett, Hockley, Yoakum, and Northeast Lea counties. These type logs show the electric log characteristics as well as the lithology. The stratigraphic variations of each formation are noted as well as the distinguishing lithologic features.

THE ROMANIAN OIL INDUSTRY. By Constantin N. Jordan. Published by the New York University Press, Washington Square, New York 3. 357 pp., $10.

Compared to the Free World's vast oil production and reserves, Romania's oil industry is relatively unimportant. But in the Communist scheme of things—as this book points out—Romania's oil is a vital element of over-all economic planning.

This is the story of Romania's oil in Communist hands. Written by a former high executive in the Romanian oil industry, it presents a comprehensive picture of the political maneuvering behind the Russian takeover, the status of Romania's oil industry today, and an objective evaluation of its probable future development. It will be of special interest to American oil men who, prior to World War II, cooperated with the Romanian oil industry to great mutual advantage.

In essence, this story is a classic example of what befalls a fine free-enterprise industry when it is subjected to Soviet control. It was published by the Mid-European Studies Center of the Free Europe Committee, the sponsor of Radio Free Europe.

IP ENGINE TEST METHODS OF RATING FUELS, first edition. Published by the Institute of Petroleum, 26 Portland Place, London, England. 84 pp., $2.79.

This is the first separate publication that England's Petroleum Institute has published covering engine test methods for rating motor, aviation, and diesel fuels. It also contains test procedures for determining the knock rating of motor and aviation fuels and the ignition qualities of diesel fuels.

Experimental Heater Will Aid In Combustion Research

THIS John Zink heater, now nearing completion in Tulsa, will be available for combustion and furnace heat-transfer experiments. Full flexibility is being provided for burning either oil or gas. An auxiliary updraft 50-hp. boiler will provide steam. Forced-draft equipment is provided as well as a dropout floor and explosion doors at each end.

Here are some heater data:

Heater capacity—10-15 million B.t.u. per hour.

Utilities—(1) Natural gas at 35 psig., (2) L.P.G. at 35 psig., (3) three grades of fuel oil with suitable preheat and pumping facilities, (4) saturated steam at 125 psig., (5) power, 110 or 220-volt, three-phase.

Assistance of John Zink personnel in experimental work will be available, if required. However, these facilities will be open for use by the personnel of operating companies or others who have a combustion problem.

Offshore, where fresh water is hard to come by . . .

Sea-Water Mud Makes Good Drilling Fluid

In Timbalier Bay field, Gulf Refining Co. has used salt-water mud successfully for 4 years. Originally, the uncertainty of the fresh-water supply brought the use of the salt or sea-water mud. However, sea-water mud can operate at the same or a slightly lower cost than fresh-water mud of the same type in fields where fresh water must be hauled in. In some cases, the distance the water is hauled has not changed that fact.

An extra advantage is the fact that salt tends to prevent hydration of clays and shales. Mud making is reduced, thereby reducing the amount of chemical needed as well as the shale trouble down hole. Two types have been successfully run. One is a sea-water lime-treated mud. The other is a low-solids sea-water mud treated with CMC, caustic soda, and an organic thinner.

by T. B. O'Brien

IN 1950 Gulf Refining Co. began developing Timbalier Bay field in Lafourche Parish, Louisiana. The field is on the coastline with only several small sand islands between it and the Gulf of Mexico. For all practical purposes, the bay water and sea water are identical. Fresh water for drilling mud must come from 30 to 50 miles away and be hauled by barge.

The first few wells in the field were shallow, in the range of 8,000 ft. However, high-pressure salt water forced the use of mud weights of about 16.5 lb. per gal. This made a good test of the practicality of using sea-water mud. A sea-water-lime mud was tried and found satisfactory. There was a very high tolerance to further contamination by sodium chloride or calcium salts.

One problem was the inability to detect when the bit drilled the top of the rock salt in the dome. On several wells, too much hole was made into the salt before there was any indication of it in the mud.

There were several salt-water flows. In only the strongest flow was the effect very detrimental to the mud.

More problems with depth . . . As operations moved to the flanks of the fields and wells drilled deeper, new problems arose. Formation temperatures reached 260° to 310° F. A hydratable or "mud-making" shale was drilled. Formations containing calcareous material and granules of salt were encountered. So were salt-water flows and high-pressure gas, with the attendant loss of circulation that is so common to Gulf Coast drilling.

Drilling under those conditions led to high-solids mud. The solids, together with the higher temperatures, caused solidification of the lime mud. Reducing the mud-solids content with water raised treating cost and caused loss of drilling time.

Therefore, other type muds were tried. The first was a calcium formate mud, but was unsatisfactory for fast, shallow drilling. Also lab tests showed it to be susceptible to solidification at high temperature. Treating costs were not too high with this mud; but since it could not be controlled at fast drilling rates, it did not have enough advantage to warrant its use.

By this time, sea-water-lime muds were being used in other fields where fresh water is expensive. They were quite successful. In most cases, the lower salt content of water found inland led to lower mud costs.

Second type tried . . . To overcome the problems with sea-water-lime muds, a mud consisting of sea water, formation solids, dietary-grade CMC (carboxymethyl cellulose), lignite, and caustic soda was tried. Early tests on shallow wells proved very promising. Therefore, its use was expanded to deep wells in Timbalier Bay and other fields.

In shallow, rapidly drilled wells control of this mud is simple and fairly inexpensive. In deeper wells where hydratable shales are drilled, control becomes more difficult, and treating costs go up. This fact was brought to light in drilling the Anahuac shale in a well offshore from Corpus Christi, Tex. The viscosity became very difficult to control; large amounts of water and CMC were required to maintain satisfactory water-loss properties.

Lab tests indicate that the technical-grade (73 per cent) CMC should give better results in this type mud than the dietary-grade CMC. Field tests are now under way with the new material. Although those tests are not complete, the technical CMC seems to operate just as well on a gross pound-per-pound basis as the dietary grade. In addition, the technical-grade CMC causes less viscosity increase than the dietary grade.

Approximately 40 wells were drilled with sea-water-lime mud, and approximately 50 wells with sea-water-CMC mud. All were drilled in fields adjacent to or in the Gulf of Mexico. Other operators are now using both types mud in about the same way as stated above. The wells range from 8,000 to nearly 16,000 ft., and mud weights at total depth vary from 10 to 18 lb. per gal.

Cost

In chemical costs alone, sea-water mud in general will be as much as, or higher than, fresh-water mud. However, to the cost of fresh-water mud must be added the cost of water. This figure may easily run in excess of $15,000 per year per rig. For rigs drilling in the 12,000 to 15,000-ft. range, the amount may be 30 to 50 cents per foot. Further, sea water in itself reduces the amount of barite used; it will average 0.3 to 0.4 lb. per gal. heavier than fresh water.

A recent survey compared mud cost on 13 wells drilled 8,000 to 13,000 ft. using sea water and on 12 wells in the same depth range using fresh water. Mud weights were about the same, and no wells were included which had fishing, lost circulation, or similar troubles. Costs were based on commercial mud additives only. The wells using sea water averaged 10,800 ft. and $1.41 per foot. The wells using fresh water averaged 11,060 ft. and $1.82 per foot. On this basis, the cost for the two groups of wells was almost equal. If, however, the cost of fresh water is added to the cost of that group of wells, use of sea-water mud looks even more attractive.

Logging . . . Electric logging is not too great a problem with sea-water muds. The only adverse effect has been a dampening of the self-potential curve. So long as there is a reasonable difference between the salt content of the mud and that of the formation waters, the curve will be satisfactory.

The author knows of approximately

Author is with Gulf Refining Co., Harvey, La. Paper presented at A.P.I. Division of Production, southwestern district meeting, New Orleans, March 9-11, 1955.

100 wells drilled to date with sea-water mud. On none of these has there been failure to get a readable electric log as a result of the presence of salt. In quantitative electric-log interpretation, the presence of salt in mud filtrate may be a help rather than a hindrance.

Mechanical separation . . . Some means of mechanical separation of drilled solids from this type mud should help. A centrifuge has been used, but not long enough to properly evaluate it. However, just as with other types of mud, there should be a saving in chemical and barite cost since maintenance of a low-solids content is imperative.

Biggest problem . . . Greatest problem to date in control of sea-water mud has been the thixotropic properties or gel rate. This is particularly true with the sea-water-CMC muds. As the formation-solids content of the system builds up during normal drilling, it becomes harder to control gels. Some thinners have helped, but keeping mud pH between 10.5 and 11 seems to be more helpful.

To keep this pH, the old idea of the tour treatment must be discarded. Instead of adding one treatment per tour in one circulation of the system, a continuous treatment must be used. The quantities used will be no different, but there will be less fluctuation in pH and thinner content of the system.

Proper control demands keeping the lowest practical solids content. There are two ways to do this. The first, mechanical separation, is not yet standard, and there will be some wells on which it will not be economical. Therefore, the second method, the use of water, becomes very important. In low-weight muds, there is no problem since most drillers like nothing better in a mud system than large streams of water.

However, as mud density goes up, keeping solids content low is more costly. Each time water is added enough barite must be added to keep the weight constant. Control by a mud engineer becomes essential. Without exception, drilling crews will overtreat a system with chemicals rather than use water and barite. If the effect of chemical treatment is predicted by pilot testing, then an economic balance can be established. The smallest amount of treating chemical and barites will be used.

To date, there has been closer supervision of sea-water muds than with fresh-water muds. Three conditions have led to this. First, treatment must be carefully tailored. Second, the crews had no experience with salt-water muds. Third, in the area where sea-water has been used, enough engineers have usually been available.

Mud Program and Treatment

For most wells using sea-water mud, the mud program is as follows: The well is drilled to 5,500 or 6,000 ft. using a mud consisting of sea water and solids from the formation. Very large amounts of water are used to keep down the sand content, weight, and viscosity. Little or no treatment is used. Mud properties are: weight, 9.5 to 10 lb. per gal.; viscosity, 40 to 50 Marsh funnel seconds; water loss, 60 to 100 cc. A.P.I.; and salt, 30,000 to 40,000 p.p.m.

At 5,500 to 6,000 ft. chemicals are added to the system. If a lime mud is to be used, 2.5 lb. caustic soda, 2.5 to 3.0 lb. thinner (generally quebracho or calcium ligno-sulfonate), 5 to 7 lb. lime, and 1.5 lb. starch are added per barrel. As drilling progresses, a tour treatment of 400 lb. caustic soda, 400 lb. thinner, 500 lb. lime, and 400 lb. starch is needed. These amounts vary as much as 50 per cent.

Diesel oil is added to the system at the same time chemicals are added. It is kept at about 12 per cent throughout the operation.

Mud weight increases as the well deepens. At 13,000 ft., in almost every case, it has reached 15 lb. per gal.; in some wells, it goes as high as 17.5 lb. per gal.

On several occasions, particularly on deep wells drilling for a long time, water additions were pretreated with sodium carbonate. This reduced the gel strength of the mud.

Various emulsifiers, both chemical and physical types, are used but none is used consistently. Therefore, more caustic soda and lime are needed to keep the mud workable.

With CMC . . . If a sea-water-CMC mud is used, here is the program. At 5,500 to 6,000-ft. depth, 0.75 to 1.00 lb. CMC, 1.5 to 2.0 lb. lignite thinner, and 0.15 to 0.75 lb. caustic soda are added per barrel. This gives a mud with these properties: viscosity, 38 to 45 Marsh funnel seconds; and water loss, 9 to 12 cc. A.P.I. Immediately after the chemical is added, 12 to 15 per cent diesel oil is put in. Water loss then decreases to 5 cc. A.P.I.; and, in many cases, it has been reduced by oil to 3.5 cc. A.P.I.

Normal tourly treatment is 100 lb. of caustic soda, 100 to 200 lb. of lignite thinner, and a fair stream of water. CMC is added as needed; usually the amount is 100 to 150 lb. per day.

Low-solids content is even more important in keeping chemical treatment down with this type mud than with lime mud. If the water is added regularly rather than at widely spaced intervals, less water and, consequently, less barite is used.

Treatment varies with the formation drilled and with the water used. Salt content of bay and sea waters varies and greatly affects the range in which the pH must be run. In the open Gulf of Mexico and in bays where the salt content of the water is over 25,000 p.p.m., the pH must be carried between 10.0 and 11.0. Where the makeup water has lower salt content, a pH of 9.0 to 9.5 can be run.

The same result comes with the CMC mud as with sea-water-lime mud when there is a large increase in salt content (as when salt is drilled or when salt water enters the hole). More caustic soda is needed to keep the mud workable.

How hard the CMC mud is to control depends on the contaminants. Many wells using sea-water-CMC muds have drilled into salt. Although the viscosity went up rapidly, it could be brought down again more easily and more quickly than with lime mud. There are several reasons for this. The solids content is lower, and the pH is lower. Moreover, the system is not saturated with chemicals.

In one well, a high-pressure salt-water zone was drilled. An increase of 2 lb. per gal. in mud weight was required to kill the flow. Little treatment was needed although the mud was badly water cut and salt content had risen from 40,000 to 165,000 p.p.m. In less than 9 hours, the mud was conditioned to return the Marsh funnel viscosity to 60 seconds and the Stormer gels to less than 10 g. Caustic soda returned the pH to between 10.5 and 11.0, and a small amount of thinner was required. No more CMC was added even though the water loss had gone from 3.5 to 7.0 cc. A.P.I.

Lab and Field Tests

On several wells using sea-water-lime muds below 14,000 ft. there was trouble in breaking circulation and running casing. Laboratory tests were then run to determine the effects of the bottom-hole temperatures on mud in circulation. It was found that sea-water-lime mud became too viscous to pump after 24 hours' aging.

No treating agent was found to eliminate the trouble, although some thinners were slightly beneficial. The best of these was gallic acid, or its sodium salt, sodium gallate. Adding ¼ lb. per bbl. of the gallic acid to the system extended the pumpable time. But, this was not the solution to the problem.

After the field test of the sea-water calcium-formate mud, samples of it were checked for heat stability. This mud was slightly more stable than the

sea-water-lime mud, but it was not suitable for depths where the temperature is over 260° F.

Laboratory tests showed that sea-water-CMC mud increased slightly in viscosity and yield. However, it had no tendency to solidify with high-temperature aging. There was some increase in water loss at high temperature.

Field tests were made using phosphates in sea-water-CMC muds, but there was very little effect. One well drilled successfully using a phosphate as a thinner. That well, however, was shallow and drilled with a very low mud weight.

Tests on thinners . . . Tests to find the most efficient thinners for sea-water mud are inconclusive. Most seem to perform better in mud from one area than from another. This condition is caused by the variation in sea-water analysis and in formation character.

Laboratory tests show promise for a thinner made from the seed pods of the tara plant (the crude material from which gallic acid is made). The material has been used in the field only twice to date. The first time little was learned. But on the second, it performed satisfactorily. It is necessary to mix tara powder in a solution whose final pH is above 11, if the pH of the system is 11 or below. A pH above 11 is required to convert the gallates and tannates in the material to their sodium salts.

Other thinners have been tested in the field and laboratory with varying success. Generally, lignites performed as well as any others in field tests.

Shale test . . . Viscosities become high in drilling the Anahuac shale offshore from Corpus Christi. Therefore, a comprehensive series of tests was run to evaluate sea-water-lime mud, sea-water-CMC mud, and the additives in sea-water-CMC mud. For these tests, mud and shale samples were taken from a well offshore from Corpus Christi and from Timbalier Bay field. Water for the tests was picked up at the offshore locations.

Table 1 is an analysis of a sea-water sample from the gulf.

TABLE 1

	P.p.m.
Chloride, Cl	17,564
Sulfates, SO_4	4,027
Bicarbonate, HCO_3	293
Calcium, Ca	426
Magnesium, Mg	1,288

Although the water's composition may vary this is representative enough for general tests. Note the high sulfate content; in fresh-water muds, sulfates are considered contaminants. However, tests using barium hydroxide on the sea-water-CMC mud showed that removing the sulfate did not benefit the samples.

Since the dietary-grade CMC when used as a fluid-loss-reducing agent raised viscosity, the technical grade (75 per cent) CMC was tested. Table 2 shows the results.

For all practical purposes, the technical-grade and dietary-grade CMC were equally effective on a pound-per-pound basis. Yet, the technical grade raised the viscosity less.

In tests to show the effect of drilled solids, sea-water-lime mud and sea-water-technical CMC performed equally well. The dietary-grade material showed a larger increase in viscosity.

Samples from the foregoing tests were aged 24 hours at 320° F. There was not enough capacity in the containers for comparison tests after aging, but this was noted:

Lime mud—thick, not pumpable.

Dietary-CMC mud—viscous but pumpable.

Technical-CMC mud—readily pumpable, not very viscous.

To find the relative effect of sea water and fresh water on formation shales, three shale samples were taken. One was from a well at Danbury, Tex., at a depth of 9,000 ft. Two were from an offshore well at depths of 6,000 and 7,800 ft. These samples were finely ground. A.P.I. tests were run to find the yield of those shales in fresh water and in sea water. Table 3 shows the results.

These tests show that without chemicals, a sea-water mud should be three times more effective for drilling hydratable shales than a fresh-water mud. The analysis of the sea water supports this. Table 1 shows that the calcium content of sea water is higher than that of the filtrate of most fresh-water muds.

Another test was made by adding 10 per cent salt water from a drill-stem test (400 p.p.m. calcium and 55,000 p.p.m. chlorine) to salt-water mud samples. There was little adverse effect on any of the mud samples.

TABLE 3

	Concentration (grams per 100 ml.)	Stormer viscosity	
		Fresh water	Sea water
Danbury shale	15	5.0	5.5
	20	7.5	6.5
	25	9.0	7.0
	30	11.5	7.5
	35	14.0	8.0
Offshore well, subsurface shale	20	8.5	7.0
	25	10.0	7.0
	30	16.0	8.0
	35	19.0	8.5
	40	29.0	9.0
Offshore well, Anahuac shale	15	7.5	7.0
	20	8.5	7.0
	25	13.0	7.0
	30	19.0	7.5
	35	40.0	8.5

TABLE 3A—YIELDS FROM TABLE 3
(Barrels per ton)

Shale—	Fresh water	Sea water
Danbury shale	17.5	7.0
6,000-ft. shale	22.13	8.08
7,800-ft. shale	23.58	7.5

TABLE 2—PERFORMANCE DATA
(Original sample weight 16.0 lb. per gal.)

Part 1 (Tara Mud)

Sample number	Additions (lb. per bbl.)	pH	Viscosity (cp.)
1	Blank	10.6	43
2	2 Tech CMC	10.6	55
3	2 CMC‡	10.6	86

Part 2 (Tara Mud)

Sample number	Gel strength		Filtration test			
	Initial	10-minute.	Ml.	Cake, in.	μp*	t_y†
1	26	26	22.0	4/32	18	50
2	3	30	3.4	2/32	44	20
3	10	63	3.4	2/32	66	40

Part 1 (Lignite Mud)

Sample number	Additions (lb. per bbl.)	pH	Viscosity (cp.)
1	Blank	10.5	60
2	2 Tech CMC	10.5	57
3	2 CMC‡	10.5	86

(Part 2 (Lignite Mud)

Sample number	Gel strength		Filtration test			
	Initial	10-minute.	Ml.	Cake, in.	μp*	t_y†
1	30	85	24.4	4/32	15	90
2	6	64	3.4	2/32	46	23
3	16	109	3.0	2/32	64	45

*Plastic viscosity, cp. †Yield point, lb. per 100 sq. ft. ‡Dietary grade.

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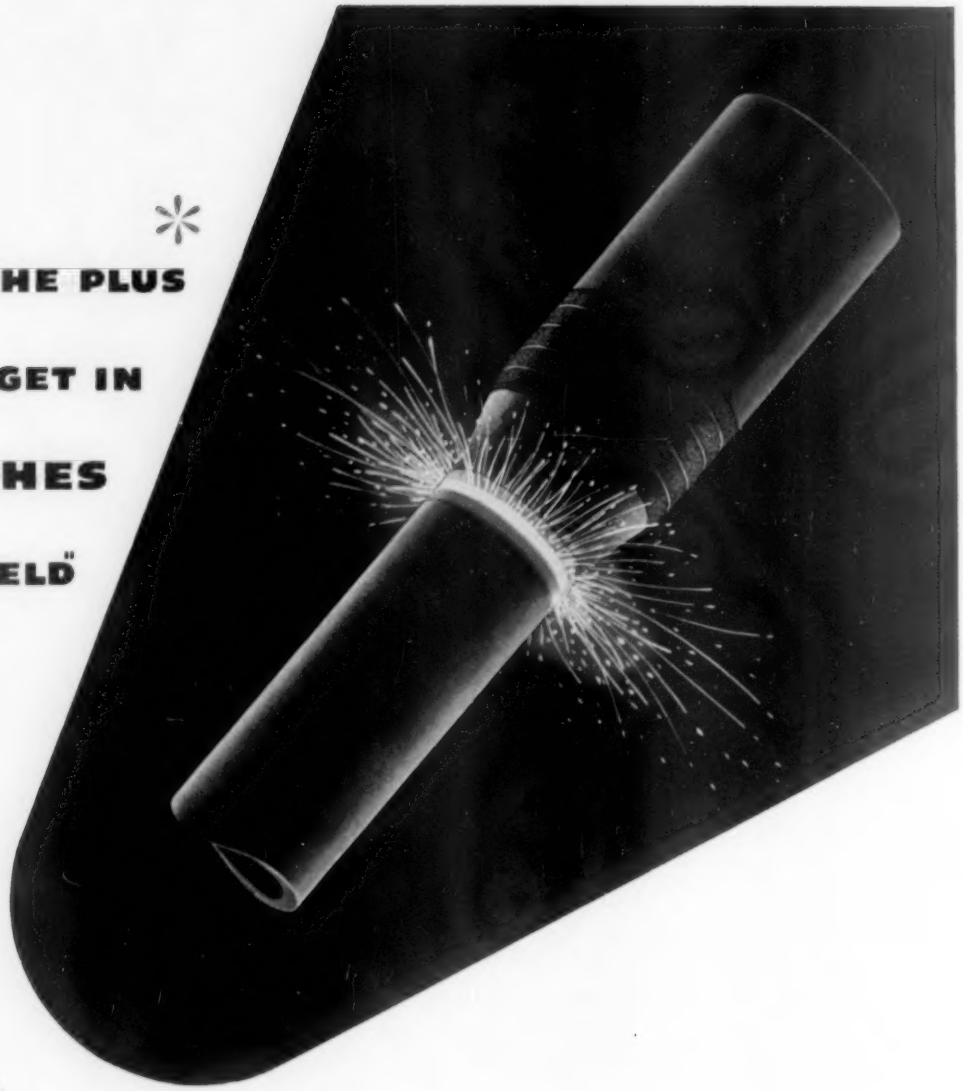
to learn more about bearings

Bits are being run on heat-treated alloy steel blocks in the continuous and exhaustive bearing tests now in progress in the Hughes Laboratory. The steel blocks prevent the bits from making hole too fast, yet permit the stresses and irregular bearing loadings that occur in actual drilling to be simulated. In these tests, the bits are run under extreme loads and at specified rotary speeds, with drilling mud circulating through the drill stem.

Because all phases of the tests can be closely controlled and duplicated, we are provided with an accurate basis for measuring comparative results and for better evaluating bearing performance. This study is only one of many rock bit research projects in progress at HUGHES looking to the constant improvement of Hughes rock bits.

THE PLUS YOU GET IN HUGHES "FLASH-WELD"



EXPERIENCE... years ahead of the field, Hughes Tool Company developed and perfected the Flash-Weld process for unitizing drill stems. In 1938, Hughes made the first "Flash-Weld" string. In the past seventeen years more than one million Hughes "Flash-Weld" tool joints have been used in unitizing 32 million feet of drill pipe. This is more than enough to equip every rotary rig in the world with a complete drill string.

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PETROCHEMICAL POINTER

It takes a rugged instrument to measure

325 Degrees Below Zero

by J. C. Evans

LIQUID-AIR separation units were small in size and simple in instrumentation until the late 1940's. A 25-ton-a-day unit was about the largest built.

The largest air units that I know of right now are the 1,000-ton-daily Hydrocarbon Research, Inc., design. Liquid-air separation units are coming into increasing use in connection with the **partial oxidation of natural gas** as, for example, in ammonia manufacture.

In liquid-air units you are working with temperatures **down in the —325° F. range.** Insulation of the temperature-measuring element is a complex problem. With this in mind, I recommend the use of the e.m.f.-type temperature instrument.

Author is maintenance supervisor, Spencer Chemical Co., at Vicksburg, Miss. Paper presented at Texas A. & M. Instrumentation Symposium, January 25-28, 1955.

However, advantages and disadvantages of both the e.m.f. and resistance bulb types will be given.

E.m.f. instruments should be of the electronic type with copper-constantan calibration. Continuous balance with automatic standardization are features you should have in an instrument of this type.

Most important in thermocouples for subzero service is reference junction compensation. Standard compensation coils work fine in the higher temperature range. They may give errors larger than can be tolerated in subzero applications. Special coils may be needed to do the job right.

The e.m.f. instrument should be very sensitive. Some manufacturers say that the sensitivity of their instruments is as much as one-thirtieth of 1 per cent of scale span or to 0.005 mv. for spans less than 10 mv.

Reference Junction Compensation

Automatic reference junction compensation is the most important of all the features in an e.m.f.-type instrument. Such compensation can be an asset or disadvantage in subzero temperature application.

The reference junction must be maintained at a constant temperature. In reality the reference junction is every electrical connection in the instrument measuring circuit and these connections are seldom at the same temperature due to the variations in the instrument case. They will not remain at the same temperature due to ambient temperature changes. To overcome this problem instrument manufacturers have grouped all of the reference junctions in one common case, protected against draft or sudden changes in ambient temperature. A reference junction compensator is provided. This compensates for the effect of ambient temperature changes and is calibrated to the type thermocouple used.

How accurate? . . . The accuracy in this method of maintaining constant reference junction temperatures is limited by ability of the compensating element to reproduce the temperature of each electrical junction or connection in the instrument case. When applied to instruments in the high-temperature

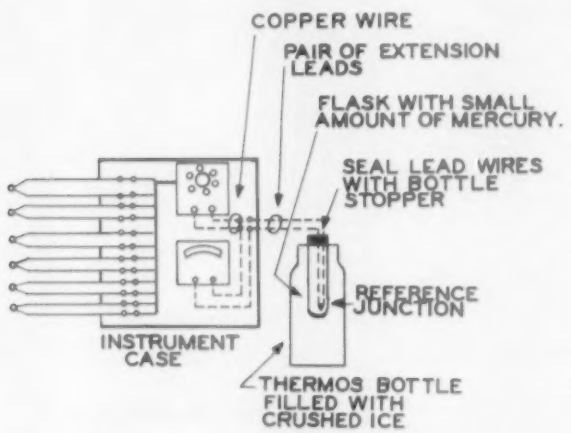

COPPER WIRE
PAIR OF EXTENSION LEADS
FLASK WITH SMALL AMOUNT OF MERCURY.
SEAL LEAD WIRES WITH BOTTLE STOPPER
REFERENCE JUNCTION
INSTRUMENT CASE
THERMOS BOTTLE FILLED WITH CRUSHED ICE

Fig. 1—The "thermos bottle" method is one method that may be used in a pinch to keep reference junction temperature constant.

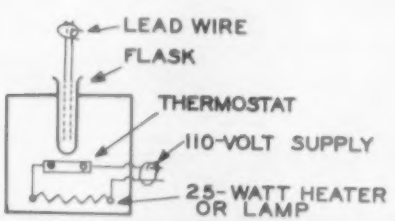


Fig. 2—Another stop-gap method is shown here.

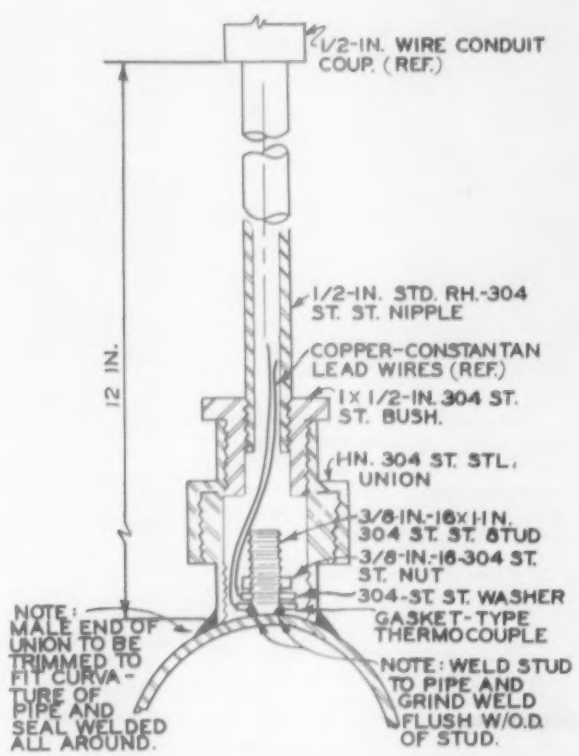

1/2-IN. WIRE CONDUIT COUP. (REF.)
12 IN.
1/2-IN. STD. RH.-304 ST. ST. NIPPLE
COPPER-CONSTANTAN LEAD WIRES (REF.)
1 x 1/2-IN. 304 ST. ST. BUSH.
HN. 304 ST. STL. UNION
3/8-IN.-16 x 1 IN. 304 ST. ST. STUD
3/8-IN.-16-304 ST. ST. NUT
304-ST. ST. WASHER
GASKET-TYPE THERMOCOUPLE
NOTE: MALE END OF UNION TO BE TRIMMED TO FIT CURVATURE OF PIPE AND SEAL WELDED ALL AROUND.
NOTE: WELD STUD TO PIPE AND GRIND WELD FLUSH W/O.D. OF STUD.

Fig. 3—This gasket-type thermocouple, Type 1D1 3A, is particularly suitable for subzero temperature work.

range, the temperature compensation most likely will be perfect or nearly so.

When applied to instruments in the subzero range it is possible to have from 2° to 8° F. error due to inefficiency of standard reference junction coils supplied by manufacturers. There are two solutions to this problem. One is by air conditioning your control room. But this is an expensive out and may be hard to justify. The only alternative you have left is to prevail on the manufacturer to build a special compensator coil which will reduce your error to less than 2° F., which is acceptable.

It depends upon how critical your process may be as to how much error you can stand. I have seen some air plants where 3° F. would mean the difference between making liquid and not making liquid and in others where operators depend upon flow indication rather than temperature to maintain levels, and where 5° or 6° F. error probably would not be noticeable.

Stopgap methods . . . One thing you can do if you have trouble is to remove your reference junction from the instrument case, and put it in a vacuum bottle filled with cracked ice (Fig. 1). The other is to hold the reference junction at constant temperature as shown in Fig. 2. I personally have used the ice-bath method for about 18 months, while the manufacturer of my instruments was designing a special coil which solved my problem of reference-junction compensation.

Pro and con . . . Most of the information presented so far could be classed as disadvantages of e.m.f.-type instruments. But, I would like to give one good point in favor of the instrument. In selecting an e.m.f. type you can have any arrangement, type, or number of thermocouples to one instrument, as long as they are of the same calibration. Also you can enclose the extension leads to more than one instrument in one conduit or duct and not encounter stray currents.

This is ordinarily not possible while using resistance bulb-type instruments. Any time you place extension leads to more than one resistance instrument in one conduit, you are going to be troubled with stray currents.

Resistance Type Instruments

Advantages . . . The resistance-type instrument is ideal for subzero temperature. It is not affected by ambient temperature changes. Some manufacturers accomplish this by using two compensating leads. Some use one. And some have solved the problem without the use of any additional leads other than the two coil leads.

Resistance-type instruments are very sensitive, accurate, and dependable.

Resistance bulbs are used as the primary temperature-measuring elements for such instruments.

Disadvantages . . . When applied to subzero-temperature use, resistance bulbs have these limitations:

1. When used in separable sockets or protective tubes they must make metal-to-metal contact from bulb to socket or protective tube in order to be responsive to temperature changes.
2. They must have the proper immersion to assure accurate measurement.
3. When used on jacketed, insulated lines the over-all length has to be sufficient to extend terminal block and connection head outside of jacketed section.
4. It is usually necessary to purchase hermetically sealed resistance bulbs using helium gas to prevent moisture condensation in the bulb.

Moisture condensation . . . This, however, can be accomplished without the purchase of hermetically sealed bulbs. If you have an ample supply of nitrogen and can purge with nitrogen using low pressure on your connection heads you can prevent moisture from seeping into the shell.

Some primary elements have a seal above the resistance coil or winding to prevent moisture from getting to the coil, but this does not protect lead wires from coil to terminal head.

It may be difficult or impossible to use a resistance bulb due to the amount of insulating material between shell and point of desired temperature, over a distance in some cases as much as 15 ft. Another limiting factor is line sizes, or as noted, being able to get proper immersion with a resistance bulb.

Thermocouples

The manufacturers of thermocouples have made much progress in the last 5 years in developing couples to meet the special applications of industry. Out of the many types of couples now available the one that is more popular with instrument engineers today for subzero temperature is the 1D13A gasket type with stainless-steel supports and glass-fiber-insulated copper-constantan leads (Fig. 3). In selecting a thermocouple for use in air plants you have to consider the possibility of heat leaks, moisture, cold junction (in subzero-temperature measurement it should be called "hot junction") and sensitivity.

Heat leaks . . . These provide one of the most difficult problems which face air-plant design engineers. Any metal extending from cold process lines or vessel through insulation and outer shell will conduct heat whether it be valve-bonnet extension, control-valve packing extension, or thermocouple.

So you can see why the standard-type couple is not as desirable as the gasket type. The gasket type can be adapted to any size line or vessel, regardless of distance from the hot junction. Instead of using the thermocouple terminal head you use a connection or junction box with sufficient terminals to connect all your hot junctions in one box. This box can be mounted on outside of insulation shell. Or it can be mounted inside of shell and covered with insulation which will protect it from sudden ambient temperature changes.

When using standard couples it is necessary to purge with low-pressure nitrogen to prevent accumulation of moisture and shorting of thermocouple.

Fast response . . . If this is desired in some cases, as for instance in Hydrocarbon Research, Inc., air units, you can use a pencil-type couple as shown in Fig. 4. Use No. 22 gage couple wire. Drill hole in bottom of well and insert tip of couple through this hole and silver solder. This allows tip of couple to be exposed direct to air stream. However, in this case it must be purged to prevent moisture. It is possible to purchase these couples with seals under terminal head that will give satisfactory service for a considerable time before giving trouble. It is recommended that in all applications where standard couples are used, they be purchased with seals under terminal heads.

References

1. For an excellent report on over-all instrumentation of Hydrocarbon Research, Inc., liquid-air units see paper by J. H. Arnold, presented at 1951, Texas A. & M. Instrumentation Symposium.

2. For brief description of Air Products, Inc., "cold box" at Spencer Chemical Co.'s Vicksburg, Miss., ammonia plant see The Oil and Gas Journal, June 7, 1954, page 86.

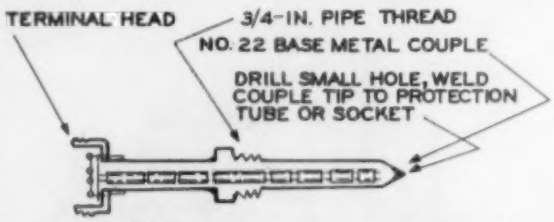
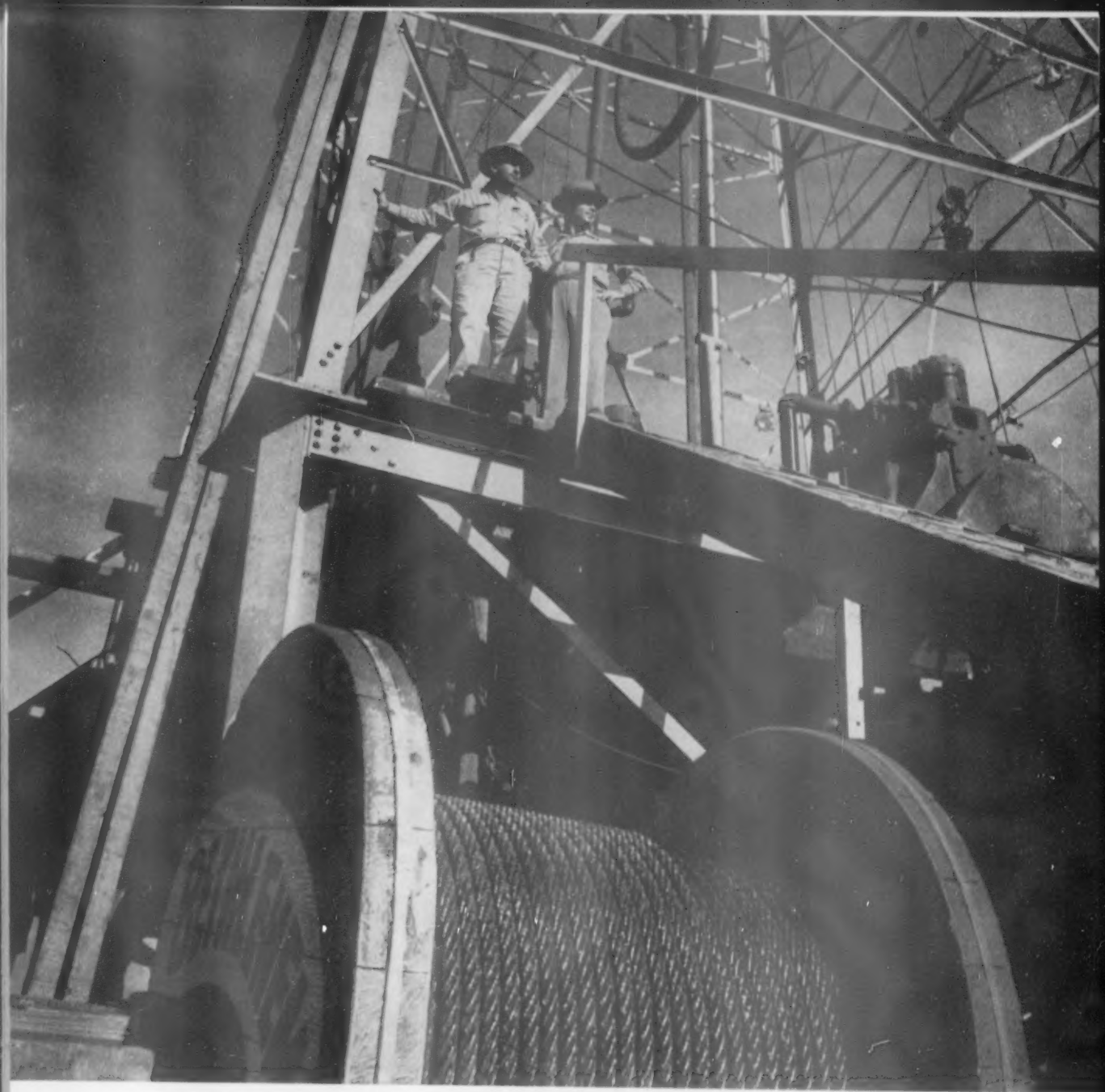


Fig. 4—A pencil-type thermocouple may be used when fast response is desired in measuring very low temperatures.



Wire Rope at Work—This is Falcon Seaboard's Rig No. 12, photographed on a deep-hole job in St. Martin Parish, St. Martinville, La. When the picture was taken, drilling had pushed beyond the two-mile level.

Falcon Seaboard's No. 12 is a big outfit, capable of managing very heavy loads. So much depends upon the wire rope that unusual care is exercised in its selection and maintenance. Here the choice was 3500 ft of Bethlehem Purple Strand, 6 x 19 construction, 1¼-in. diam—Form-Set (preformed) for easy handling. Added strength and resistance to crushing were assured by an independent wire rope core. This combination provided a generous margin of reserve, and helped the rig meet every load condition very comfortably.

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NOTE—To Pipeline Corrosion Engineers . . . Here's a quick

Graphical Method of Checking Stability Of Cathodic-Protection Rectifier Stacks

It is well known that capacity of a rectifier declines with use. How much it has declined can be found quickly by the method described here. A variable voltage source, an ammeter, a voltmeter, and a sheet of curve paper are all you need to get an accurate estimate.

by Charles D. Stroud

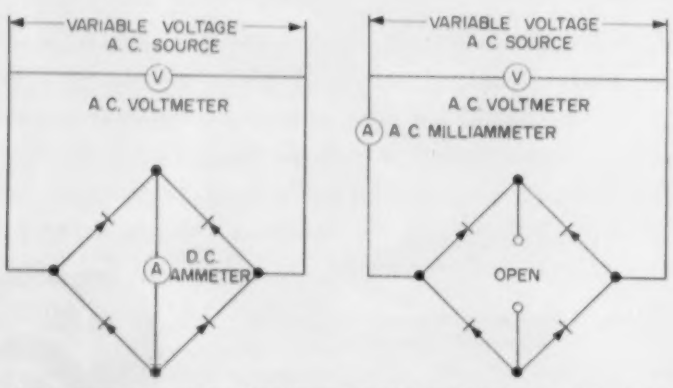
A FEW simple tests and a curve drawn from resulting data offer a ready means of determining stability and efficiency of dry-type rectifiers. Proper interpretation of these data enables the engineer to predict rectifier deterioration during normal use. It also affords an empirical basis for selection of rectifier types and designs. The growing number of miles of pipeline with cathodic protection increases the importance of proper operation and maintenance of rectifier equipment. The corrosion engineer must spend much time checking the operation of cathodic-protection units. A record of the continued operation of an installation is often kept in the form of periodic readings of the rectifier outputs. Since these readings reflect seasonal variations in the cathodic-protection-current requirements, they are not an accurate source of information concerning condition of the rectifiers.

Failures of cathodic-protection installations can be serious, especially in critical areas. One that has failed represents an investment that is not giving a desired return. Some of the most common causes of failure, such as ground-bed deterioration and lightning damage, have been remedied by improvements in cable and anode design and in rectifier protection. The loss of efficiency and the ultimate failure of dry-type rectifiers during normal service is still a problem.

Author is senior electrical engineer, Texas Pipe Line Co., Houston.

Stacks lose efficiency, then fail . . . The actual reasons for, and mechanics of, failures due to aging are not completely understood. It has been proved conclusively, however, that the final cause of failure is heat—whether generated within the rectifier cell itself or induced from some external source. Heat generated within the cell is concurrent with a loss of cell efficiency.

This loss of efficiency does not represent many dollars on the power bill in its early stages. More important, it indicates the condition of the rectifier cells and their ability to produce the current for which they were designed. The prompt replacement of unstable rectifier cells will not only be justified in power savings, but will also give more reliable cathodic protection.



Circuit diagrams for making short-circuit and open-circuit tests on rectifier stacks. Tests give forward and reverse dynamic characteristics. Figs. 1 and 2.

Though efficiency is the final criterion for evaluating rectifier elements, testing for efficiency and interpreting of the data derived are impractical for several reasons:

1. Confusion exists concerning the terminology "conversion efficiency" and "true efficiency."
2. Direct measurement of efficiencies at various loads is time consuming and requires relatively expensive equipment.
3. The limiting values of these efficiency measurements, whether good or bad, are difficult to interpret.

Having a rectifier that is stable at its required load is the end result desired. The degree of stability can be determined from a graphical evaluation of open-circuit and short-circuit characteristics of the rectifier cell.

To measure these characteristics, the following are required:

1. Variable a.c. voltage source.
2. D.c. ammeter and shunt, sized to measure rated output current of rectifier.
3. A.c. voltmeter for input voltage.
4. A.c. milliammeter, (0-1,000) to measure reverse current.

Short-circuit test . . . Data from this test, which is also called the forward-resistance test, will allow plotting of one portion of the dynamic characteristic curve. Connect a d.c. ammeter, having not more than 50-mv. drop, across the d.c. terminals of the rectifier stack as shown in Fig. 1. Apply a measured a.c. voltage to the input terminals of the stack.

Raise the applied voltage gradually and record the a.c. volts and d.c. amperes until rated current of the stacks is reached. A plot of the values derived will give curves similar to those shown in the first quadrant of Figs. 3 and 4.

Open-circuit test . . . Open-circuit measurements, also called the reverse-resist-

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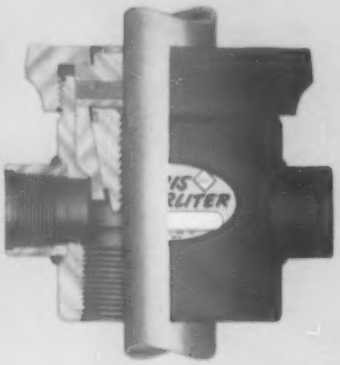

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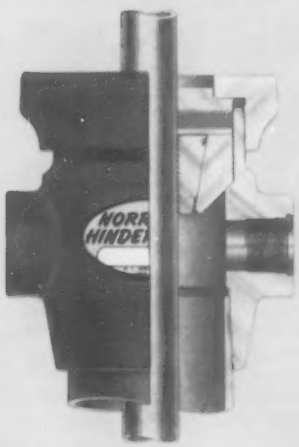

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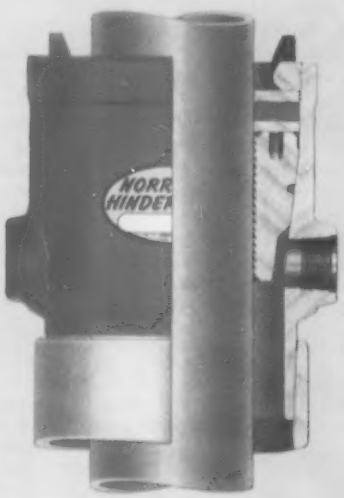

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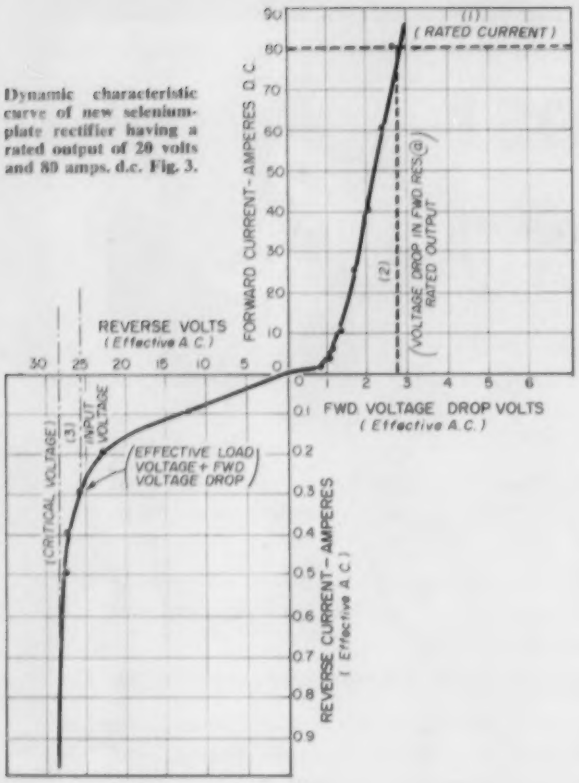
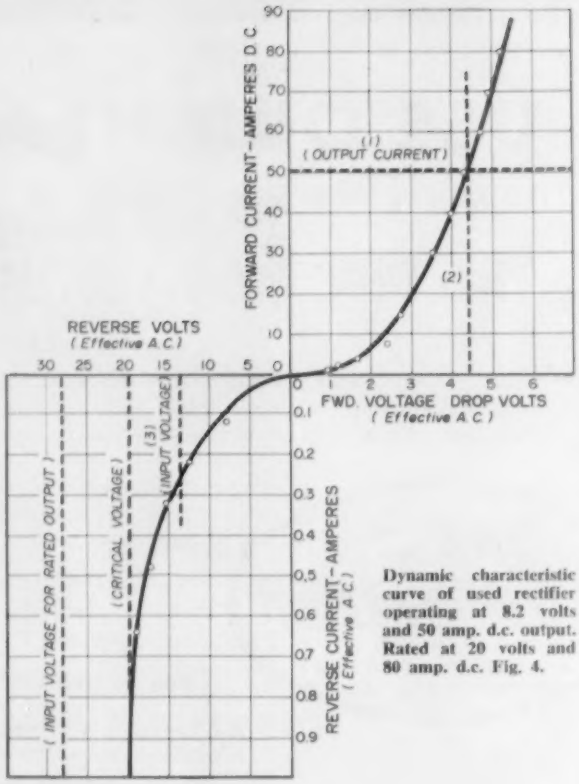


Dynamic characteristic curve of new selenium-plate rectifier having a rated output of 20 volts and 80 amps. d.c. Fig. 3.



Dynamic characteristic curve of used rectifier operating at 8.2 volts and 50 amp. d.c. output. Rated at 20 volts and 80 amp. d.c. Fig. 4.

ance test, give readings for the second portion of the dynamic characteristic curve. Connect an a.c. milliammeter (0-1,000) and an a.c. voltmeter as shown in Fig. 2. Raise the applied voltage gradually from zero and record the a.c. volts and amperes. Do this until the a.c. current is about 1,000 ma. or until the voltage becomes critical; i.e., until the current increases with little or no increase in applied voltage. A plot of the values derived will produce curves similar to those shown in the third quadrant of Figs. 3 and 4.

Interpretation of Curves

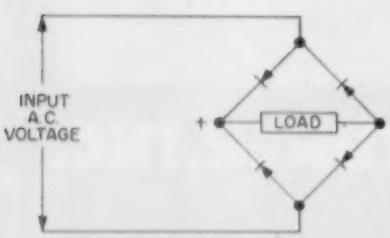
A new rectifier should deliver its rated output with an input voltage at least 10 per cent lower than the critical voltage of the rectifier. This 10 per cent power voltage allows some latitude for increasing the applied voltage to compensate for aging.

An example of the above is shown on Fig. 3, which is the dynamic characteristic curve of a new 20-volt, 80-amp. rectifier stack. When this stack is producing rated current, the forward-resistance voltage drop will be 2.7 volts. By adding this figure to the **effective value** of the rated output voltage, the reverse voltage is obtained. This voltage, 25.5 volts, is at least 10 per cent lower than the critical voltage of this stack, indicating that the rectifier is stable at its rated output.

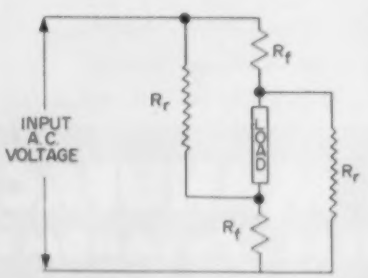
As a rectifier ages, it can be considered as operating with the same stability as a new rectifier provided its output does not require an input voltage greater than 90 per cent of the critical voltage of the stack. For example: The curve in Fig. 4 shows the dynamic characteristic curve of a rectifier stack that has been in service several years. When new, the stack had a characteristic curve similar to the one shown in Fig. 3. The unit from which the curve in Fig. 4 was derived was in cathodic-protection service and was operating at 8.2 volts and 50 amp.

By a graphical determination of the input voltage required, it can be seen that the unit is still operating dependably; however, this unit can no longer produce its rated output in its aged condition since the input voltage required would be 8 volts over the critical value.

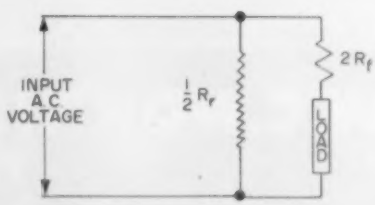
Under normal operating conditions the reverse losses are usually less than one-fifth of the total losses. However, there is a rapid increase in this loss when the inverse voltage is raised. Since the reverse voltage of the selenium plates is critical, a sufficient increase in forward resistance, due to aging, can require an input voltage to main-



Single-phase, full-wave bridge circuit, neglecting resistances. Fig. 5.



Equivalent circuit resistance during positive-half cycle. Fig. 6.



Approximate equivalent circuit which assumes $R_r >> R_f$. Fig. 7.

That's the long-life valve on sulphuric acid

THE CASE HISTORY: At a large midwestern refinery there were recently two valves of different makes on a 90% sulphuric acid line. As seen in the photo above, these valves worked under identical conditions, almost side by side—each operated about three times daily.

Less than a year in the line, the valve at left started leaking, with the leak getting rapidly worse. In contrast, the Crane No. 475½ all-iron gate valve at right, with two years' continuous service to its credit, was still giving completely good performance.

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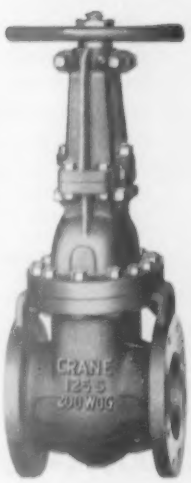

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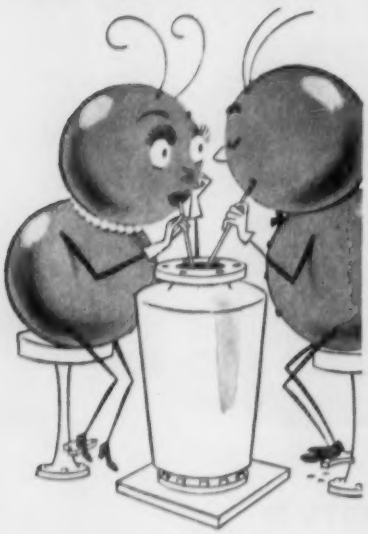

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tain rated output which will be high enough to damage the plates.

When the plates have aged so that the combined effect of the change in forward and reverse resistance causes the input voltage to approach within a few volts of the critical value, the rectifier is no longer dependable.

Efficiency calculations . . . A graphical evaluation of stability and indirect calculations of efficiencies and rectifying ratios at various loads may be made from the dynamic characteristic curve. This is possible because the curve provides the means of determining parameters of the rectifier's equivalent circuit.

The equivalent circuit from which the graphical use of the dynamic characteristic curve may be derived is approximated as follows: Fig. 5 shows a single-phase, bridge-type rectifier circuit consisting of four rectifying elements. During the positive half-cycle of the applied a.c. voltage, the load current passes through the forward resistance of two elements in series and is blocked by the reverse resistance of two elements in parallel. Fig. 6 shows the bridge circuit redrawn to represent the resistance encountered by the a.c. voltage wave during the positive half-cycle. During the negative half-cycle, the forward resistance (Rf) and the reverse resistance (Rr) simply change places. The net result is that the circuit remains the same during the entire a.c. cycle. Since Rr is large compared with Rf, the equivalent circuit may be approximated as shown in Fig. 7.

The parameters, 2 Rf and ½ Rr, in the equivalent circuit may be determined from the dynamic characteristic curve, since this curve is a voltage-versus-current plot. The point slope of the curve in either the forward voltage and the current direction or the reverse voltage and current direction will give the resistance offered to current flow by the applied a.c. voltage.

Investigation of the conditions of the tests shows that the resistance calculated for the forward direction is equal to twice the forward resistance of one rectifying element or 2 Rf. This is one of the parameters required in the equivalent circuit. Conversely, the resistance calculated for the reverse direction is equal to one-half the reverse resistance of one rectifying element, or ½ Rr, the other parameter.

Using the values of resistance as determined from dynamic characteristic curve for various load voltage and currents, efficiencies may be readily calculated. Care should be taken to use only effective values of current and voltage throughout the calculations. By doing this the procedure will remain valid for the rectifier stack regardless of the type of load considered.

BOOKS

CLASSIFICATION OF ROCKS. Volume 5, Number 1, of the Quarterly of the Colorado School of Mines, Golden. Published by the department of publications, Colorado School of Mines, Golden. $1.00.

Marking the beginning of its second half-century of service to the mineral industries, the Colorado School of Mines Quarterly has released a significant publication of vital interest to both professional geologists and amateur rock hounds.

"Classification of Rocks" is the work of Dr. Russell B. Travis, assistant professor of geology at the School of Mines and a 1943 graduate of that college.

Knowing the confusion and misinformation resulting from the many and various methods of rock nomenclature, Dr. Travis has attempted to name rocks on the basis of visible features, using terms and conventions generally accepted at present.

As a result, the publication is extremely important to organizations engaged in exploration for petroleum, metals, nonmetals, and radioactive mineral deposits. These organizations' development programs depend on standardization of rock names among many men and departments.

Included in the Quarterly are full instructions for naming any rocks—igneous, sedimentary, or metamorphic—and three complete reference charts, each 9 by 16 in., for use in the field or classroom. Sixty-six photographs illustrate features described in the text.

DRILLING RECORDS FOR OIL AND GAS IN UTAH. By George H. Hansen and H. C. Scoville. Published by Utah Geological and Mineralogical Survey, 200 Mines Building, Salt Lake City. 110 pp. $5.00.

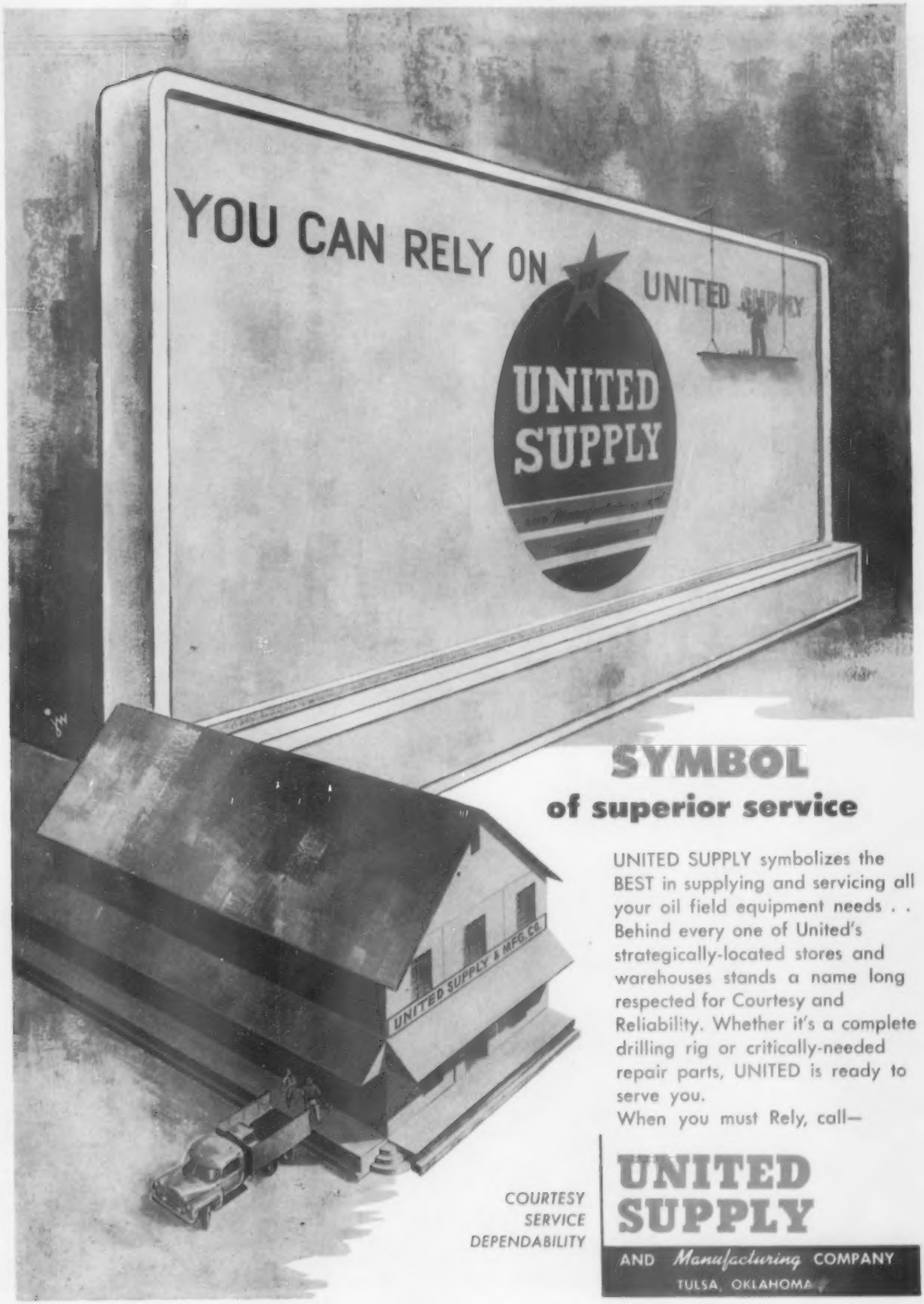
The survey has done its utmost to compact the vast amount of detail available on the various wells into as convenient and durable a manual as possible. By including a map of each county bound in the volume it has been possible to plot the individual wells so that their position can be more readily determined. Also, such a treatment of the subject matter avoids the necessity of a large supplemental map with a pock in the back. The table of abbreviations on page 17 is convenient and informative since the interrelationships and subdivisions of each geologic formation are made more readily apparent.

APPLIED MASS SPECTROMETRY, a conference report. Published by the Institute of Petroleum, 26 Portland Place, London, England. 333 pp. $6.96.

This book is a compilation of the papers presented and discussion held at the Institute of Petroleum's Conference on Applied Mass Spectrometry held in October 1953 at London. Both papers and discussion fall into these five categories: (1) general applications of mass spectrometry; (2) specific analytical applications of mass spectrometry; (3) application of mass pectrometry to fundamental problems; (4) mass-spectrometer instrument developments; and (5) computing methods for mass spectrometry.

BIBLIOGRAPHY OF GEOLOGY THESES, COLLEGES AND UNIVERSITIES OF THE UNITED STATES, 482 pp.; available on request from Petroleum Research Libraries, Inc., Denver.

This is a preliminary unindexed list of geological theses that are on file in the colleges and universities of the United States. The schools are listed in alphabetical order; the theses are listed alphabetically by authors under the school where the thesis was written. Although the list of these is not yet complete, the index will be of value as a handy reference especially for geologists doing research work.



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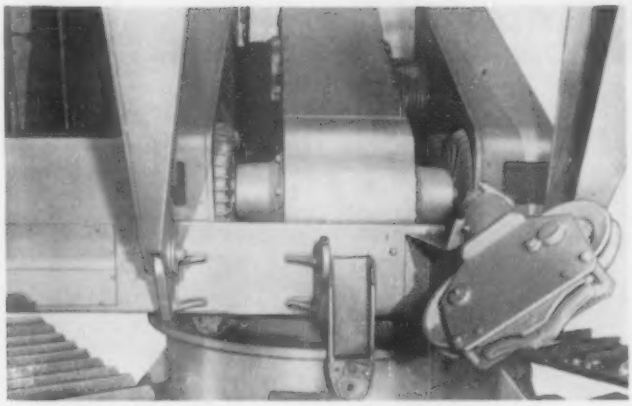

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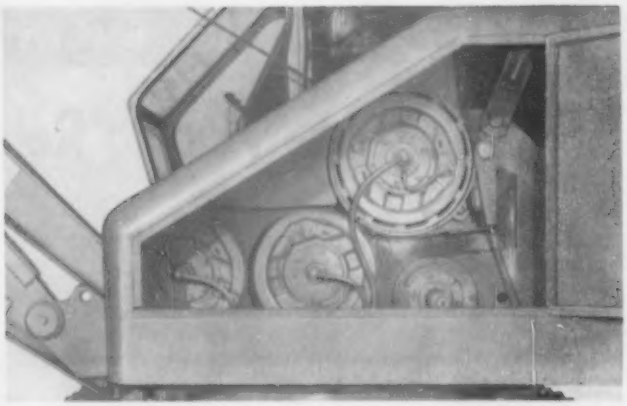

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by
Dr. R. F. Nielsen

ENGINEERING FUNDAMENTALS

Short Cuts to Finding Relative Permeabilities—2

THE Welge method of obtaining relative permeabilities from core data will be shown by two different procedures.

Example No. 3

Problem: A core having a pore volume of 3.5 cc. is 100 per cent oil saturated and then "air driven" at a low-pressure differential. From the following corresponding values of cumulative oil and gas produced, Q_o and Q_g, calculate the relative permeability ratio k_g/k_o as a function of saturation by the Welge method.

Q_o (cc.) =	0.5	1.0	1.5	2.0	2.4
Q_g (cc.) =	Break-through	4.6	14.3	40.7	High

Viscosity of the oil is 1.2 cp. and that of the air 0.018 cp.

Solution: Draw the coordinate scales for S_g (gas saturation) and F_g (defined below) as shown in Fig. 1, the top line being $F_g = 1$. From the data, find average gas saturation S_a and number of pore volumes injected, PVI:

$$S_a = Q_o/3.5 \text{ and}$$

$$PVI = (Q_o + Q_g)/3.5$$

S_a =	0.143	0.286	0.43	0.57	0.685
PVI =	0.143	1.61	4.5	12.2	∞

From each of the above values of S_a on the $F = 1$ line, draw a line having slope $dF/dS = 1/PVI$.

1/PVI =	7.0	0.62	0.22	0.082	0

Draw a curve tangent to all these lines. This curve gives F as a function of S_g, where:

$$F = F_g = [1 + (k_o\mu_g)/(k_g\mu_o)]^{-1} \quad (6)$$

Since $\mu_g = 0.018$ and $\mu_o = 1.2$ (the gas and oil viscosities):

$$k_g/k_o = (0.015\,F)/(1 - F) \quad (7)$$

From the curve, we obtain for F and k_g/k_o:

S_g =	0.15	0.2	0.3	0.4	0.5	0.6
F =	0.910	0.944	0.970	0.985	0.994	0.998
k_g/k_o =	0.15	0.25	0.49	0.98	2.5	7.5

Author is associate professor of petroleum and natural-gas engineering, Pennsylvania State University.

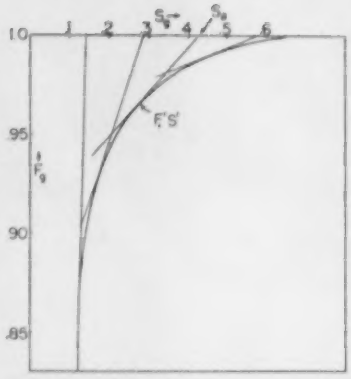

FIG. 1—Construction of curve giving fraction flow of gas as a function of saturation.

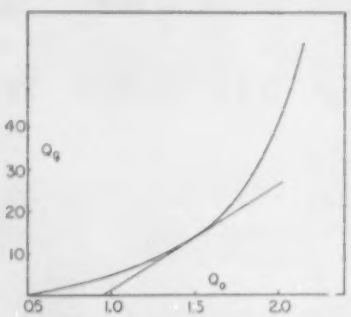

FIG. 2—Calculation of instantaneous gas-oil ratio from cumulative production curve.

Example No. 4

Relative-permeability ratios may also be calculated (perhaps more accurately) from instantaneous gas-oil ratios obtained from slopes of the cumulative production curve (Fig. 2).

Problem: Calculate k_g/k_o ratios and corresponding saturations by the Welge method using above data.

Solution: Calculation will be made for the instant at which 1.5 cc. of oil were produced. Q_g is plotted against Q_o as in Fig. 2. Gas-oil ratio at $Q_o = 1.5$ is obtained by drawing assumed this gas-oil ratio is determined by saturation S′ near the outlet face. From previous equations and geometry (Fig. 1):

$$(dF/dS)(S_a - S') = (1 - F') \quad (8)$$

or

$$(S_a - S') = PVI\,(1 - F') \quad (9)$$

where F′ is the value of F at point of tangency (F′, S′) of line from S_a. Point (F′, S′) corresponds to conditions near the outlet when average saturation is S_a. If gas-oil ratio is determined by relative-permeability ratio near the outlet:

$$GOR = F'/(1 - F') \quad (10)$$

F′ being fractional flow of gas at this point. Since gas-oil ratio = 25.3, $F' = 0.962$. S′ may then be calculated from Equation 9. From tables of the previous procedure, when $Q_o = 1.5$ and $Q_g = 14.3$, $S_a = 0.43$ and PVI = 4.5. Hence:

$$S' = 0.43 - 4.5\,(1 - 0.962) = 0.26$$

$$k_g/k_o = GOR\ \mu_g/\mu_o = 25.3$$

$$\times\ 0.015 = 0.38$$

That is, 0.38 is the gas-oil relative-permeability ratio corresponding to a gas saturation of 0.26. This fits into the previously calculated table. The entire calculation, starting with drawing of the tangent to the production curve, must be repeated for a series of values of the production.

The Welge method presupposes that the length of the capillarity zone, to which assumed saturation distribution does not apply, is small compared to core length. For this reason, the air drive is usually made as fast as data can be taken (to keep the capillarity zone small). Even so on tight cores the pressure differential should not be so high that corrections for it are necessary. Also the data just after air breakthrough may not be applicable because of the capillarity zone, even if it is relatively small.

A gas drive, rather than a liquid drive, is usually employed because the former is simpler.

the tangent at this point. The slope gives the gas-oil ratio as 25.3. It is

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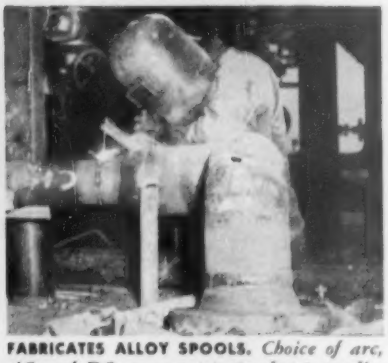

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Designing and Applying High-Speed Turbines—7

Controlling Speed in Process Controls

THE speed-control system described in Installment 6 is also suitable for process control.

In direct-acting process control (Fig. 1) instrument air, usually with a range of 3 to 15 psig. for full control range, can displace the control pressure. Instrument air loads a relief valve in this speed-and-pressure regulator. The governor is set for preemergency and is normally inactive. That is, it is set for a higher

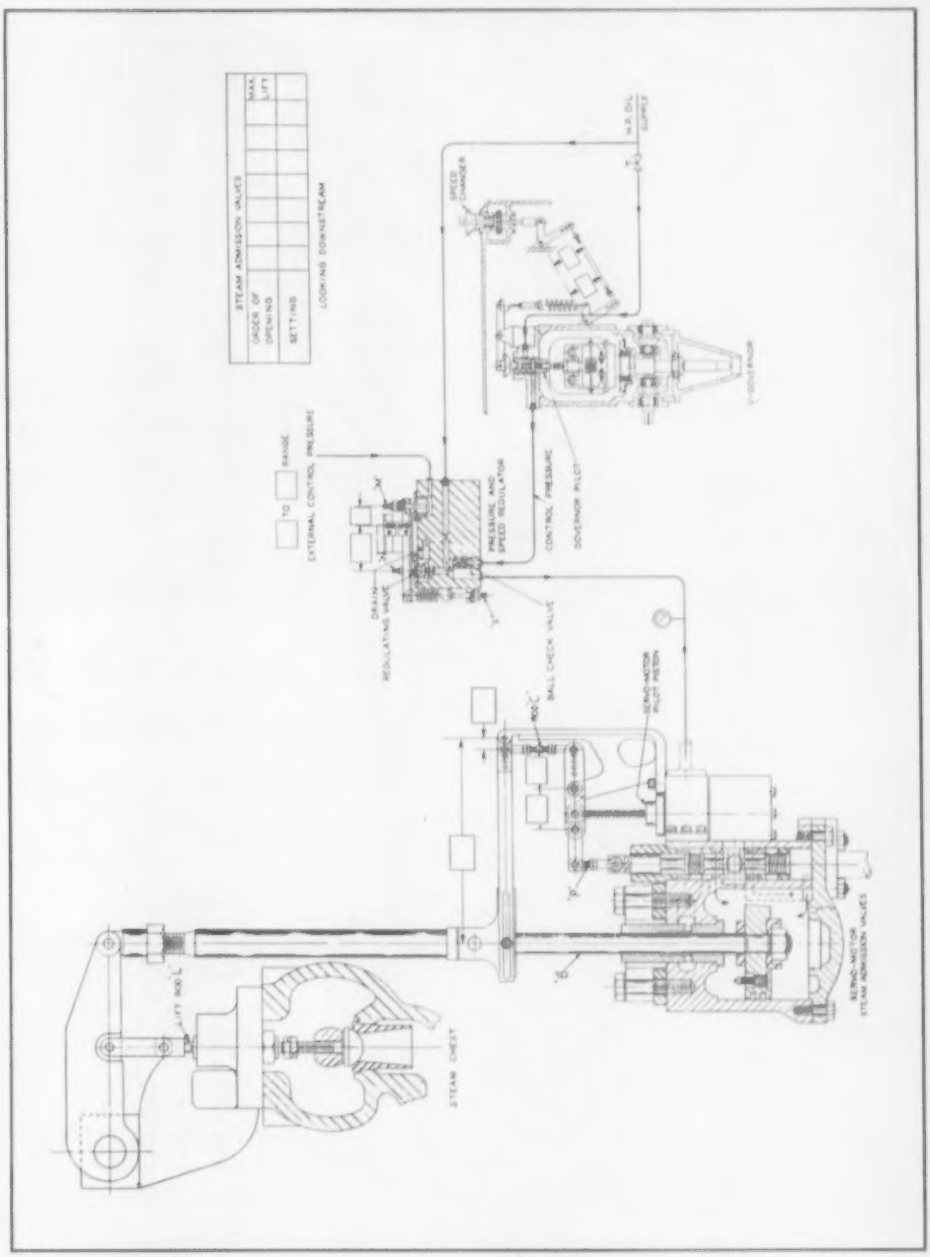

Fig. 1—Speed-governing system with external control of direct-acting type.

speed than operating speed. By moving the speed changer, the governor will take over. Or it will take over later if the speed increases to the speed setting of the governor.

The main feature of this control is that the external control acts directly and promptly on the valve servo and the power input to the turbine. It has complete control of the turbine to the extent that it can shut off the steam flow.

Author is chief engineer, turbine division, Elliott Co., Jeannette, Pa. Paper presented at the petroleum mechanical-engineering conference of the A.S.M.E., held in September 1954 at Los Angeles.

Alternate method of process control . . . An alternate method of process control tied in to the speed governor is to have the instrument air act directly on the speed changer, Fig. 2. In this illustration there is a beam across the governor-balancing pilot with the speed changer loading one end of the beam and a bellows for instrument air loading the other end. The speed changer is set for a certain minimum speed. The air control will raise the speed and take the turbine through the desired speed range.

This control can be arranged to give either minimum or maximum speed for failure of instrument air. It has the same control effect as an automatic frequency controller that resets the speed. But the speed range is much wider. From 100 down to 70 or 60 per cent is a common requirement on these air controls. Occasionally it drops down to 30 per cent of rated speed.

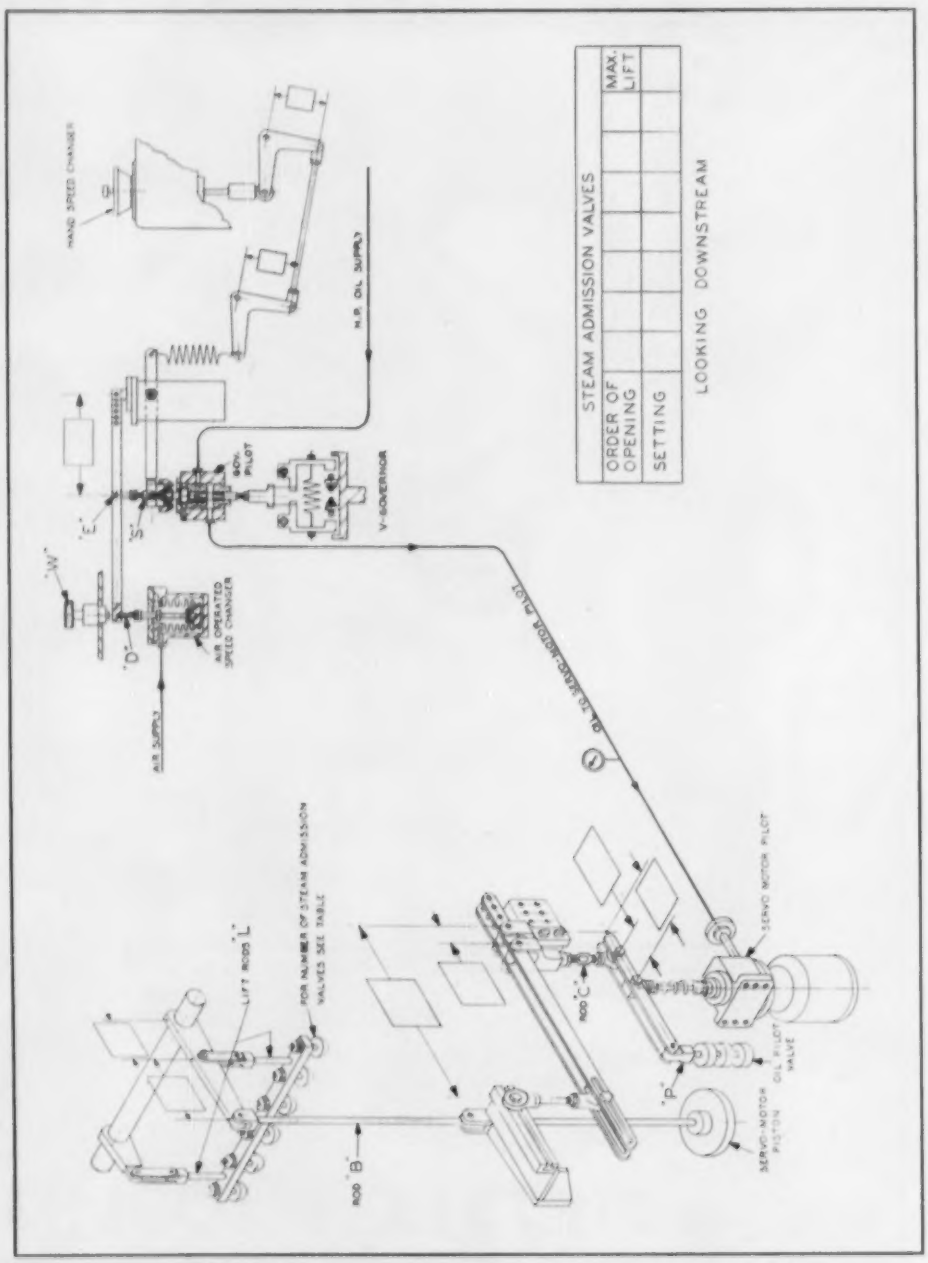

Fig. 2—Speed-governing system with external control acting on governor speed changer.

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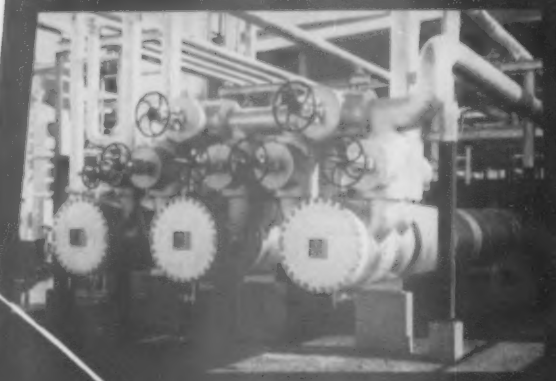

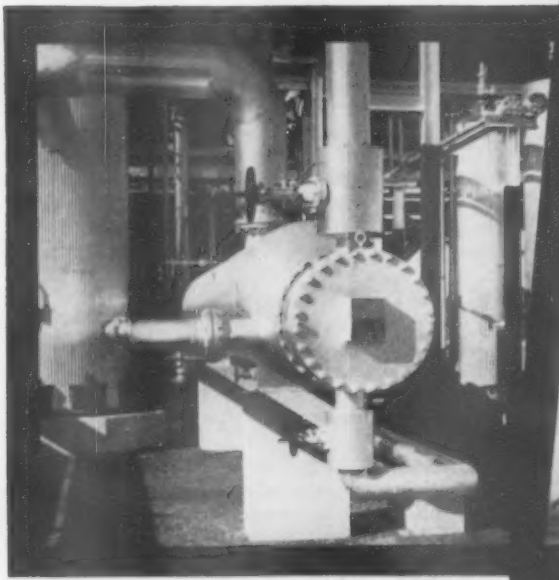

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Changes in specifications received in the Western offices. Finished quotation mailed January 29.

FORMAL P. O. RECEIVED FEB. 1 . . .

Client's contractor, Hudson Engineering, gives go ahead for finished drawings for piping and setting.

WORKING DRAWINGS TO SHOP FEB. 17 . . .

Approved drawings turned over to shop for fabrication.

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U. S. Supreme Court

Cobalt Bromide Test for Water in Propane—3

The Effect of Propylene Content

by R. M. Gentry and V. H. Gunther

SINCE commercial propane may, by N.G.A.A. specification, contain appreciable propylene, it will be helpful to examine the effect of the presence of this compound on the cobalt bromide test. Data on the solubility of water in liquid propylene are available[4] and these are shown plotted on Fig. 1 of installment No. 1. The water content of the saturated vapor in equilibrium with the liquid has been calculated and is also plotted in Fig. 1.

Vaporization ratio . . . Using these data, the equilibrium vaporization ratio for a 50 per cent mixture of propane and propylene was calculated at several temperatures. This was done by interpolating between the saturation curves for liquid and vapor phases of propane and propylene. That is, the solubility of water in the liquid phase of the mixture was taken midway between the solubilities of water in the individual pure liquids.

These equilibrium vaporization ratios for the mixture are plotted as a function of temperature in Fig. 2 of installment No. 1. Using 40 per cent relative humidity as the minimum necessary to obtain a wet cobalt bromide test, calculations of the limiting sensitivity of the test at several temperatures were made for the propylene-propane mixture. The results are shown in Table 1 of installment No. 2.

Authors are with Shell Oil Co. at Wood River, Ill. Paper presented at the Symposium on Methods for Testing L.P.G., St. Louis, September 27-28, 1954.

Sensitivity decrease . . . These results indicate that there is quite a decrease in the sensitivity of the test when the sample contains 50 per cent propylene. Also, results will vary with the propylene content. So the propylene content of the sample must be approximately known in order to arrive at a correct estimate of the water content.

Experience with routine plant-control samples containing approximately 10 per cent propylene indicates that the minimum water content of the liquid phase necessary to give a positive test using a 3-gal. sample cooled to 35°-40° F. is about 0.006 per cent of weight compared to a calculated value of approximately 0.003 per cent of weight. This divergence is not considered excessive in view of the nature of the calculations and the assumptions made. Part of the discrepancy may be due to the fact that equilibrium is not maintained between the liquid and vapor since the sample container is not agitated during the cobalt bromide test.

A weathering test was made in which a sample with a liquid water phase present was vaporized under the conditions of the cobalt bromide test. Spot samples of the vapor was taken. It was found that equilibrium did not maintain instantaneously, and that the water content of the vapor dropped about 10 per cent.

What Was Determined

- The sensitivity of the cobalt bromide test for moisture in commercial propane is affected by the amount, temperature, and propylene content of the sample, even though the latter two of these factors are not taken into account in the interpretation of results by the present N.G.A.A. method.

- Enough sample must be taken to keep the water concentration of the sample from depleting too much during the test. The N.G.A.A. procedure specifies a 15-gal. sample when the test is to be made in the laboratory rather than on the storage vessel. But calculations based on phase equilibrium data indicate that this may be reduced to a more convenient volume of 3 gal.

- By cooling the sample in an ice bath, the ratio of concentration of water in the vapor to that in the liquid is increased with a corresponding gain in sensitivity. For propylene, the ratio of concentration of water in the vapor to that in the liquid is approximately half of that for propane. Consequently, the sensitivity of the cobalt bromide test is appreciably less when propylene is present, and decreases as the propylene content increases.

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3. N.G.A.A. Publication 2140, "Liquefied Petroleum Gas Specifications and Test Methods," 1951.
4. Shell Development Co., Emeryville, Calif., private communication.

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by R. L. Dockendorff

DRY INSTRUMENT AIR—6

Desiccants and Dryer Sizing

SEVERAL desiccants of the alumina type perform about the same as activated alumina, differing only as to the vapor-pressure vs. water-content scale. Fig. 10 shows comparative adsorption of several desiccants, including activated alumina and silica gel, as functions of relative humidity and temperature. For the alumina, this particular relation is almost independent of temperature; in silica gel, there is some variation with temperature.

The single line for alumina on Fig. 10 becomes the developed function of Fig. 7 (Installment No. 5). The conveniences of this should be apparent from the above discussion of regeneration cycles.

It is possible, when drying saturated inlet air, to obtain performance of a freshly charged activated alumina dryer showing an average adsorption of up to 10 lb. removable water per 100 lb. alumina. This compares to the 16 to 18 lb. shown in Figs. 10 and 7.

Channeling . . . The difference between these two values reflects the channeling and incomplete saturation of the bed (which must be expected with cells of conventional proportions) as compared to an experimental adsorber with a high length-to-diameter ratio. Certain instrument-air dryers at Baytown using activated alumina were rated by the manufacturer at 7.7 per cent removable water. Some aluminas can be rated only for lower adsorption, some for more. Relatively lower values for design use are listed by Amero, Moore, and Capell,[2] and by Campbell, Skinner, and Lawrence.[4]

When the entering air is not water-saturated, the theoretical adsorptive capacity of activated alumina, rather than 18 per cent, may be seen in Fig. 7. For example, suppose air at 100° F. having a dew point of 30° F. is to be further dried to a 0° F. dew point. The maximum theoretical water takeup by the alumina is 3.7 per cent including the water on the regenerated bed of 1.7 per cent. Therefore, only 2.0 lb. of water can be extracted from the air by 100 lb. of alumina during a given drying cycle. A design figure would not exceed 1.3 lb. per 100 lb., and might be as low as 1 lb.

Silica gel . . . This is a much-higher-capacity adsorbent on a weight basis. It has a maximum theoretical adsorptivity of about 40-50 as compared to 18 for activated alumina. But it is somewhat less rugged than alumina and is considerably more expensive. Both are in use at Baytown.

Branded desiccants . . . Several of these that have enjoyed broad use in air-drying services may be bought on the market. One of these is Sovabead, a combination of silica and alumina which has intermediate properties. Others are Florite or Porocel, activated bauxites that have about two-thirds the initial drying capacity of activated alumina and are somewhat less expensive.

It should be emphasized that the capacity required of a drying bed, and therefore its size, is determined by the amount of water in the inlet air. No more than a given amount of this water can be taken up by a bed even at complete saturation. On the other hand, dryness of the processed air with a given desiccant is determined by the regeneration procedure—a combination of pressure, temperature, dryness of the purge gas, and time of heating.

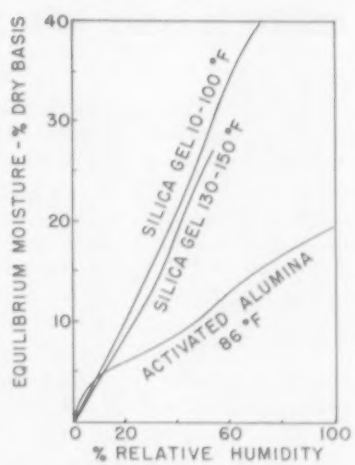

FIG. 10—Comparative adsorption of various desiccants as functions of relative humidity and temperature.

Sizing the Drying Installation

In sizing a drying installation of the regenerative type, the first thing to determine is the time needed to regenerate with a reasonable amount of regeneration equipment. Then an on-stream time is chosen which appreciably exceeds the regeneration time. This preferably matches a working-shift cycle of 8 hours, or 1 day, or 1 week if capacity is very small. For very large units of high capacity, it may be optimum to figure the regeneration cycle very closely regardless of an odd time interval that may result. Automatic valve changing according to a time cycle may be helpful in speeding regeneration. But such equipment seldom is necessary; most installations at Baytown are manual.

The total amount of air to be processed in the selected cycle time is noted, and the total water to be removed is calculated. The bed selected should be large enough to provide at least 100 lb. of alumina for each 10 lb. of water to be removed per cycle. Then a second bed normally is provided to permit the regeneration of the first without interruption of operations. If regeneration becomes very expensive in a large installation, the optimum may call for three or more cells total, with one regenerating.

To keep regeneration time low in the case where a very expensive desiccant is required and the quantity must be reduced to a minimum, reasonable regeneration facilities might become quite generous.

Heating equipment . . . Calculation of the required heating equipment where external transfer surface is preferred calls mainly for a circulating gas stream that has enough heat content to raise the desiccant to about 200°-250° F. It must also supply the heat of desorption of water, and a temperature 50°-75° F. above the desired maximum bed temperature.

References

2. Amero, Moore, and Capell; C.E.P., 43:349 (1947).

4. Campbell, Skinner, and Lawrence; Pet. Ref. 31-10:106 (1952).

Author is with the engineering division, Humble Oil & Refining Co., at Baytown, Tex. Paper presented at Texas A. & M. process instrumentation symposium held January 25-28, 1955, at College Station, Tex.

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by **W. L. Nelson**
Technical Editor

QUESTIONS ON TECHNOLOGY

Chemical Composition of Oils Used In Carbon-Black Manufacture

This department was created for the purpose of aiding managers, superintendents, engineers, chemists, and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

"What is the chemical composition of carbon-black oils? Are they unsaturated compounds? Wm. P. F.

Although there are several somewhat routine methods of analyzing oils for percentage of unsaturation and percentage of aromatics, such analyses tell really nothing about chemical structure and can be considered as nothing more than control or purchase tests. By such tests the range of analysis of good oils for "black" manufacture are:

Paraffins, 4-40 per cent.

Aromatics, 8-52 per cent.

Unsaturates, 38-60 per cent.

Sum—aromatics and unsaturates, 60-96 per cent.

However, one good oil contained 66 per cent paraffins (perhaps an error in analysis) and only 6 per cent aromatics.

To obtain good yields, the characterization factor (specific gravity divided into the cube root of the absolute mean boiling point, °F.) should be at least as low as 10.8, and a really superior stock will have a factor of 10.1 (and lower than 10.1 would be even better). These factors are lower than those of aromatic hydrocarbons or unsaturated hydrocarbons, and accordingly a good oil for carbon-black manufacture must not only consist of aromatics but any side chains must be unsaturated. The very best oils consist of condensed ring structures with unsaturated side chains.

Table 1 is a summary of the average properties of various general kinds of hydrocarbons and it was based on information similar to that of Table 2. Three good carbon-black oils are also included in Table 1 for comparison. Although some operators employ a 500° F. midboiling-point feed stock (Tables 1 and 2) most are now going to higher-boiling feeds. However, Tables 1 and 2 are based on materials of 500° F. boiling point because so little is known about the hydrocarbons that boil at 550° or 650° F.

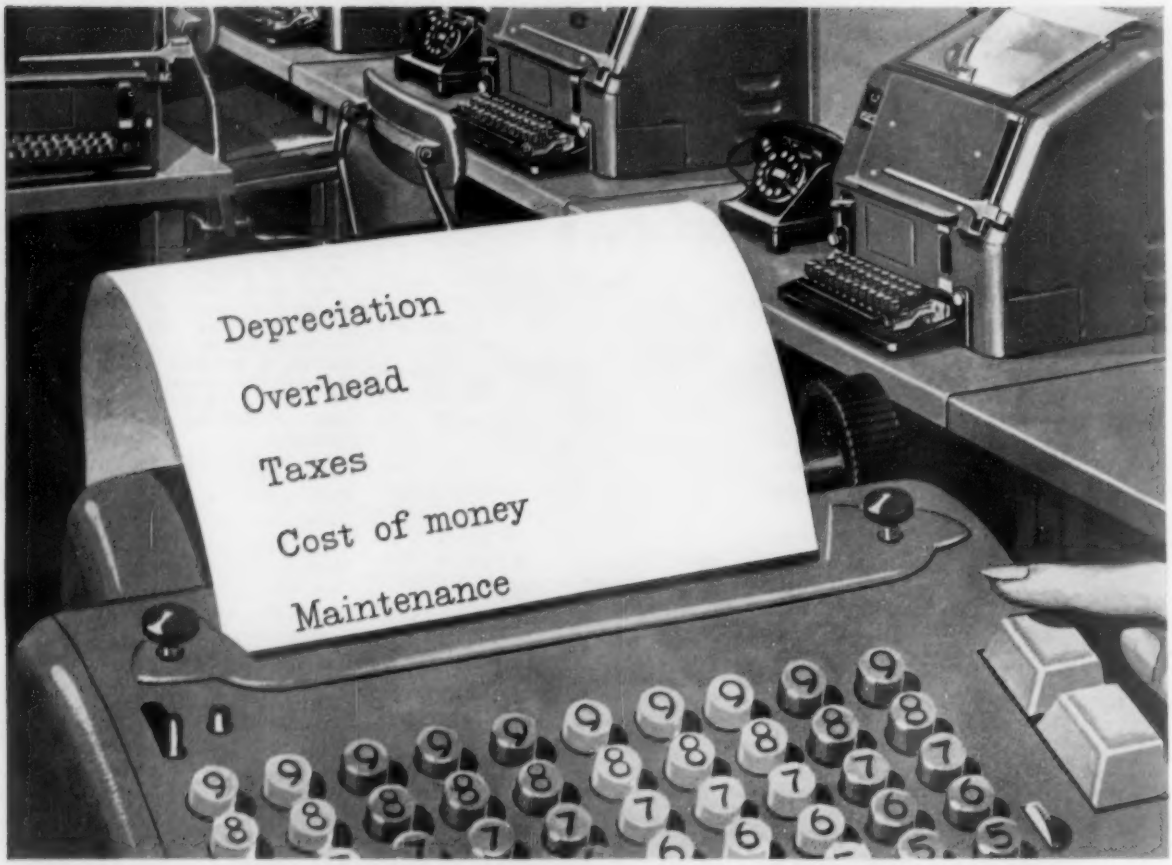
TABLE 1 — APPROXIMATE AVERAGE PROPERTIES OF HYDROCARBONS THAT BOIL AT ABOUT 500° F.

Type of hydrocarbon—	A.P.I. gravity	Characterization factor	Correlation index	C/H ratio	Relative yield*	Representative formula
Paraffins	53.6	12.66	3.5	5.6		$C_{14}H_{30}$
Simple olefins	49.9	12.5	3.4	6.0		$C_{14}H_{28}$
Diolefin	46.9	12.3	13.0	6.45		$C_{14}H_{26}$
Aromatics	31.0	11.3	48.0	7.6	69	$C_{14}H_{22}$
Aromatics with unsaturated side chains	23.1	10.7	72.0	9.6	102	$C_{14}H_{17}$
Unsaturated and condensed ring structures	16.1	10.2	92.0	10.2	121	$C_{14}H_{16}$
Oil sample, No. 1	20.7	10.6	74.6	8.7	105	$C_{14}H_{19}$
Oil sample, No. 2	22.8	10.7	70.1	8.4	100	$C_{14}H_{20}$
Oil sample, No. 3	19.7	10.55	77.1	8.8	107	$C_{14}H_{19}$

*Using 100 as the yield from 10.7-characterization factor stock.

TABLE 2—PROPERTIES OF SOME HIGH-BOILING AROMATIC AND CONDENSED HYDROCARBONS

		Boiling point				Charac.	Corre.	Carbon hydrogen
Aromatics—	Formula	°C.	°F.	Specific	A.P.I.	factor	index	ratio
Octyl benzene	$C_{14}H_{22}$	262.0	504.0	0.852	34.6	11.6	38	7.63
4-Benzl heptane	$C_{14}H_{22}$	242.0	468.0	0.854	34.2	11.42	43	7.63
2-Phenyl 2,5-dimethyl hexane	$C_{14}H_{22}$	241.0	466.0	0.8844	28.4	11.02	58	7.63
3-Phenyl 3-ethyl hexane	$C_{14}H_{22}$	237.5	460.0	0.8748	30.3	11.11	53	7.63
1,2,3,4-Tetraethyl benzene	$C_{14}H_{22}$	254.0	489.0	0.888	27.7	11.08	58	7.63
1,2,4,5-Tetraethyl benzene	$C_{14}H_{22}$	250.0	482.0	0.8844	27.8	11.05	59	7.63
1-Isopropyl 4-methyl benzene	$C_{13}H_{24}$	265.0	509.0	0.8632	32.4	11.45	43	7.5
Diamyl benzene	$C_{13}H_{24}$	264.0	507.0	0.851	34.8	11.61	37	7.5
Average			486		31	11.3	48	7.6
Unsaturated side chain aromatics—								
2-Phenyl heptadiene 1-3	$C_{13}H_{16}$	247.0	477.0	0.9384	19.3	10.42	81	9.75
1-Phenyl hexadiene 1-3	$C_{12}H_{14}$	250.0	483.0	0.9253	21.4	10.60	75	10.3
2-Phenyl 4-methyl hexene 2	$C_{13}H_{18}$	238.0	461.0	0.8839	28.6	11.00	59	8.68
Average			474		23.1	10.7	72	9.6
Unsaturated ring structures, etc.—								
Diphenyl methane	$C_{13}H_{12}$	261.2	504.0	1.004	9.4	9.87	111	13.0
Dicyclohexyl	$C_{12}H_{22}$	238.5	461.0	0.8848	28.4	11.0	60	6.54
Phenyl cyclohexane	$C_{12}H_{16}$	238.0	460.0	0.9502	17.4	10.23	90	9.0
Diphenyl	$C_{12}H_{10}$	255.2	491.0	1.041	4.4	9.45	120?	14.4
Cyclohexyl cyclohexene-1	$C_{12}H_{20}$	237.0	459.0	0.901	25.6	10.8	66	7.2
2-Isopropyl naphthalene	$C_{13}H_{14}$	264.0	507.0	0.990	11.4	10.0	104	11.15
Average			480		16.1	10.2	92	10.2



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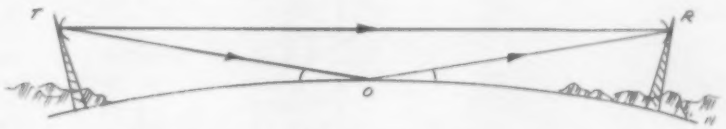
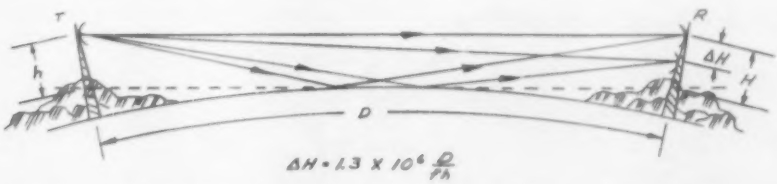
FADES can be caused by reflected signals if they arrive out-of-phase with the main signal. If this is the case . . . (Fig. 1).



ONE WAY to beat the fades is to design a system so natural obstacles keep reflected signals from hitting the receiving antenna. If this can't be done . . . (Fig. 2).



DIVERSITY RECEPTION—i.e., using two receiving antennas—will prevent signal cancellation due to reflections. Proper spacing of antennas is given in the formula. Fig. 3.

How diversity reception can improve microwave systems

by Stanley E. Benson

DIVERSITY reception is one of the best answers to a common problem on microwave systems—fades caused by atmospheric changes. Most microwave systems can take fades of about 30 decibels and still give satisfactory service. But deeper fades cause excessive noise and usually result in a useless system.

The most common cause of such fades seems to be interference between the direct and ground-reflected signals. Signal-strength recordings of this type fade show flat-topped peaks separated by deep, sharp drops. Diversity reception can be used to advantage in some of these cases.

Fades caused by reflection . . . Fig. 1 shows the profile of microwave paths between a transmittter, T, and a receiver, R. Part of the signal travels over the direct path TR. But a portion is transmitted to the reflection point O on the earth's surface and then is reflected over the path OR to the receiver. A phase reversal of 180° takes place when a signal is reflected at low grazing angles.

If these two paths differ in length by a half wavelength, the two signals arriving at R are in phase and add, resulting in a greater than normal signal. If the two paths differ in length by a whole wavelength, the two signals at R are in phase opposition and tend to cancel, giving a less-than-normal signal.

The amount of interference between direct and reflected signals is dependent on how well the earth's surface behaves as a reflector. The best conditions for reflection, and hence the worst conditions for interference, are over smooth sea water.

Measurements show that the reflection coefficient is between .75 and .98 for grazing angles of 1° or less over smooth sea water.[1] It may also approach these values over flat land areas. The coefficient is defined as the ratio of magnitudes of reflected to incident signals.

Varying atmospheric conditions . . . If it were possible to keep all conditions constant, it would be simple to locate transmitting and receiving antennas so that the difference in path length of the two signals would be a half wavelength. Then signals would always arrive at the receiving antenna strengthened by the reflected wave.

But this cannot be done. Both the direct and reflected signals travel through an atmosphere which is anything but homogeneous. It varies in temperature, density, and moisture content—all factors which determine dielectric constant and refractive index.

The result is that the microwaves are bent this way and that, traveling over paths constantly changing in direction and over paths which are sometimes longer and sometimes shorter. The signal arrives at the receiver strong due to reinforcement in one instant and in the next, very weak due to cancellation.

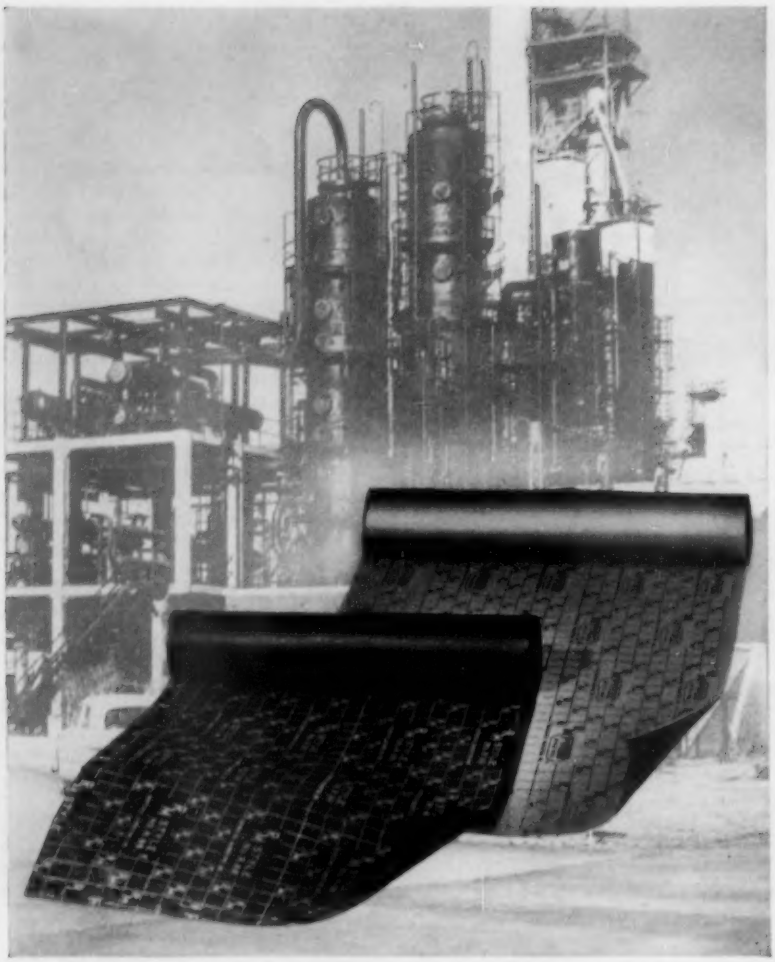
Steps can be taken to minimize this effect. Fig. 2 shows the profile of a path which avoids the reflection problem. A location has been chosen which places an obstacle in the path of the reflected signal. By this means, the direct signal is transmitted without interference and the reflected signal is effectively blocked.

Another method is to tilt the receiving antenna upward at a slight angle. Parabolic antennas, widely used for microwave transmission, are designed to have a narrow beam angle. For example, a typical 4-ft. paraboloid at 7,000 megacycles has a beam width of about 2½° to the half-power points. Assuming the angle between the direct and reflected wave is about 0.75°, an upward tilt of 1¼° would cut down the direct signal about 3 decibels and reduce the reflected signal about 8 decibels. This is some help but not near enough.

The best method, where the terrain can't be used as a shield, is to use some form of diversity reception. This provides for simultaneous reception of two or more signals, each arriving over a path unique in its transmission qualities. The system then selects the best-quality signal for demodulation.

There are two common diversity systems in use at the present time on microwave systems: frequency diversity and space diversity. A common form of frequency diversity uses two simultaneously transmitted frequencies. These are received by one antenna and fed through a tee connection to

Author is with Philco Corp. Condensed from a report to the committee on radio facilities of the American Petroleum Institute,



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two separate receivers, one for each frequency. The two transmission frequencies are so widely separated that the two received signals will be subject to widely different transmission factors. It is hoped that the statistical distribution will be such that one or the other receiver will receive a good signal.

This system has a serious disadvantage. The simultaneous use of two transmitting frequencies wastes an extremely valuable commodity, frequency spectrum.

A more common form uses space diversity. In this system, the same transmitted frequency is received simultaneously by two antennas separated vertically in space by a definite interval, ΔH, as shown in Fig. 3. Each antenna is separately connected to a receiver. The outputs of the two receivers are combined so that the one giving the stronger signal output is automatically selected for use.

At a given moment, the transmission conditions around a receiving antenna will, at one point, cause the direct and reflected signals to reinforce because of the half-wavelength difference in their path lengths. A little distance away, a condition exists where the direct and reflected signals cancel due to a whole wavelength difference in path lengths.

A field-strength diagram would show a pattern of lobes and nulls, the lobes representing signal reinforcement and the nulls representing signal cancellation. Atmospheric changes and their effects on transmission cause this pattern to oscillate up and down past the receiving antenna much like an enormous fan moving past it. The spacing between lobes varies only slightly with atmospheric changes.

Thus, by separating the two antennas of a space-diversity system by a distance equal to half the distance between two adjacent lobes, a deep signal fade on one antenna is coincident with a strong signal on the other. By this method, complimentary diversity reception results. It always assures a strong resultant signal as compared with a somewhat unreliable statistical distribution of signal obtainable from a frequency-diversity system.

The spacing between the two antennas may be calculated from the following relation which is derived in reference 2.

$$\Delta H = 1.3 \times 10^6 \, D/fh$$

where

ΔH = vertical spacing of antennas in feet.

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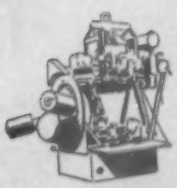

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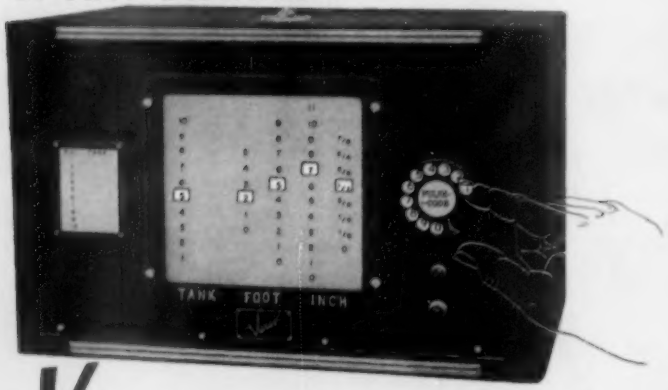

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D = distance between transmitter and receiver in miles.
f = frequency in megacycles.
h = elevation in feet of transmitter antenna above the plane tangent to the earth's surface at the point of reflection. A convenient method for determining the value may be found in reference 3, page 685.

Both the basic receiver and the diversity receiver for each direction get their signals from separate antennas mounted at the required vertical spacings. After detection, the two outputs are combined and applied to the video or multiplex frequency amplifier of the equipment and transmitted in the usual manner. The receiver operating on the weaker signal of the two is squelched automatically. It cannot interfere with the other or introduce noise. Squelching is done by a differential relay operated by the difference in automatic-gain-control currents of the two receivers. The system is set so a difference of about 6 decibles in input signal strength will operate the relay and squelch the unwanted receiver.

Switching from one signal to the other is done so smoothly that there is no perceptible interruption to the received intelligence during the transfer interval. Nor is there a perceptible change in received signal level. Equipment of this type must, of course, be used with a properly designed microwave path whose dimensions have been accurately determined from a careful survey. It then will provide reliable operation on a full complementary diversity basis, even though serious reflected wave interference is a prevailing condition.

Where Space Diversity Has Worked

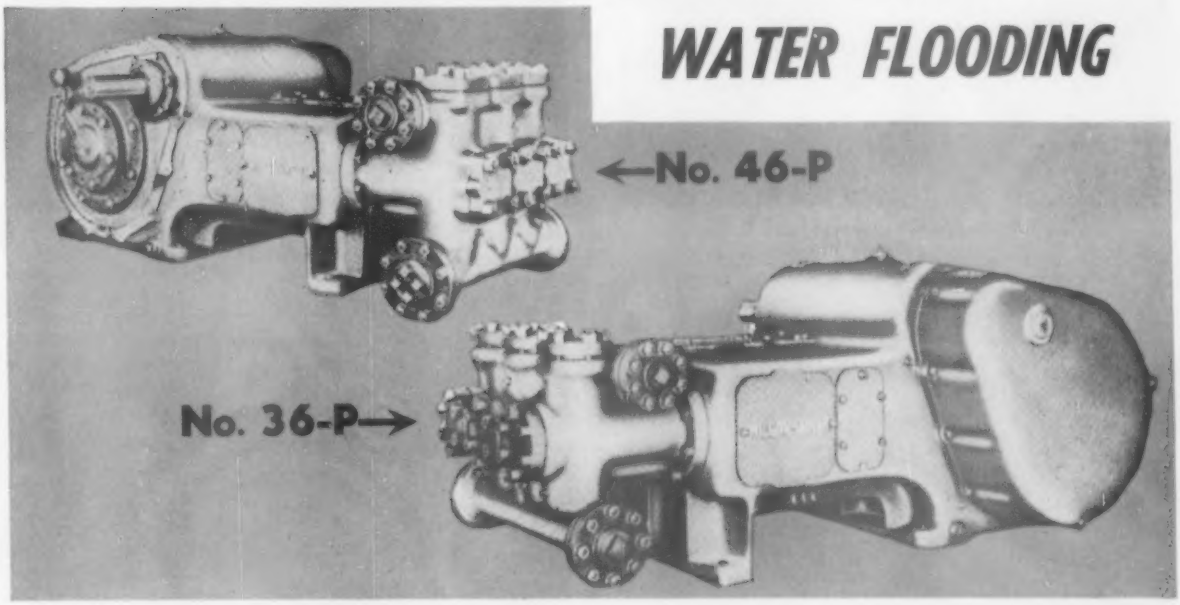
Space-diversity equipment has been installed in several microwave links, and the theory described above has proved valid to a marked degree. The first successful system was put in by the U.S. Army Signal Corps in 1945.[2] It was placed on a 78-mile overwater path between Mount Soledad, Calif., (elevation 850 ft.) and Mount Orizana on Catalina Island (elevation 2,100 ft.) on a system working at 4,650 megacycles.

Before installing diversity equipment, operation was completely unreliable. No improvement resulted from equipment modifications. And changing polarization of the electric vector from horizontal to vertical made no noticeable difference.

Diversity reception was then installed with antennas separated vertically by 25 ft. For the next month, no propa-

HERE ARE TWO WILSON-SNYDER TRIPLEX PLUNGER PUMPS PROVEN SUPERIOR FOR—

WATER FLOODING



Where a change from medium to high-pressure fluid handling is foreseen, as in water-flooding operations, the operator can convert his medium pressure No. 46-P pump to pump at higher pressures by exchanging his No. 46-P fluid end for a No. 36-P fluid end. Thus, the interchangeable fluid ends of the two pumps permit one power end to serve throughout a water-flooding project.

The No. 36-P and No. 46-P Triplex Plunger Power Pumps are heavy-duty, horizontal, three-cylinder, single-acting pumps for pumping water, oil, acid or similar non-abrasive liquids at high pressure and in a wide capacity range. A combination oilbath and force-feed lubrication system assures an ample supply of oil to all working parts. Diaphragm stuffing boxes and fluid-end stuffing boxes are force-feed oil or pressure grease-lubricated. All service points are readily accessible. One piece, direct flow fluid end assures minimum restriction to flow. Various types of plungers are surface-hardened for wear resistance. To change from one size plunger to another, it is only necessary to install new stuffing box gland bushings, packing, and lantern rings. Manganese-bronze fluid valves and seats are of the wing-guided type. For special service applications, stainless-steel valves and seats of the same type can be furnished.

Call or Write Houston Headquarters or your Nearest Wilson Store for additional information

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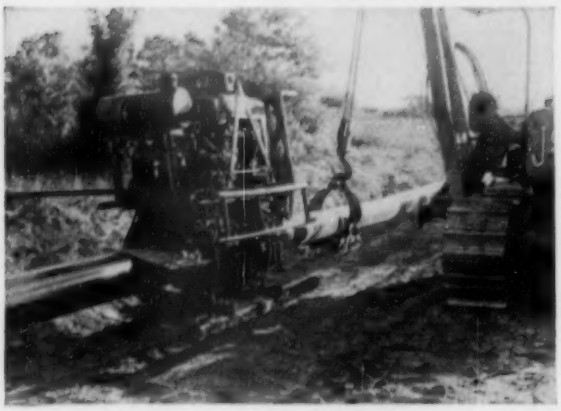
Pipeline laid over rugged terrain.

Pipeline ditch cuts through shale and rock.



Cleaning Machine and primer application.

NO-OX-ID and wrapper applied by Traveliner.

Why Corning Natural Gas relies on NO-OX-ID for pipeline protection

In 1954 Corning Natural Gas Company, Corning, N. Y., began expansion of their transmission system with 16 miles of 12-inch and 7 miles of 10-inch pipe. Dearborn NO-OX-ID Coating Combinations were specified. Over-the-ditch pipe protection was hot applied by a traveling, coating and wrapping machine using NO-OX-ID 2-C Primer, NO-OX-ID 6-X Coating and NO-OX-ID Reinforced Asbestos Wrapper.

WHY NO-OX-ID IS PREFERRED:

When asked how his crew liked working with NO-OX-IDs, the contractor, Mr. Joyce, stated: "They had never previously applied hot NO-OX-ID. The ease and convenience of application, plus freedom from personal hazards, caused complete satisfaction all around." As a result, Corning Gas plans to specify NO-OX-ID protection on additional pipeline reconditioning during 1955.

Before you specify on your next job, check with Dearborn...a Pipeline Engineer is available for consultation.

It pays to specify

Dearborn NO-OX-ID®

DEARBORN CHEMICAL COMPANY • Merchandise Mart Plaza • Chicago 54, Ill.

ADVANTAGES OF NO-OX-ID PROTECTIVE COATING

- ★ Applied hot or cold
- ★ By hand, by Traveliner or at the mill
- ★ No noxious fumes
- ★ Requires less equipment
- ★ Lasts longer

WRITE FOR BULLETIN

"Protecting Underground Pipe from Corrosion with NO-OX-ID and NO-OX-IDized Wrappers" tells the story. Your copy is ready upon request.

gation hits were experienced, and the circuit had an unusually low background noise level. Later tests produced equally good results.

In 1953, tests were made by the U.S. Air Forces in Europe at a frequency of 7,000 megacycles to determine a path for reliable microwave communications across the English Channel.

The tests were made across the narrowst part of the channel, 24.3 miles. At first, signals were transmitted directly from a parabolic antenna at an elevation of 365 ft. Later, a tower with a passive reflector was built raising the radiating antenna to 530 ft. The signals were received on two antennas separated vertically.

In each case, signal-strength recordings for each antenna used separately had broad maxima and sharp minima caused by reflected-wave interference. When both receiving antennas were used, separated by the calculated half-lobe spacing, fairly good complementary diversity was obtained. But occasionally the two signals faded simultaneously. When the spacing was reduced to 0.7 of the calculated value, periods of in-phase operation disappeared and complete complementary diversity was achieved.

Other tests were made during 1954 at a frequency of 2,100 megacycles and over nearly the same path across the English Channel. These show the same sort of results and demonstrate the usefulness of space diversity in eliminating deep fades due to reflected wave interference.

References

1. D. E. Kerr: "Propagation of Short Radio Waves," Radiation Laboratory Series, Vol. 13, McGraw-Hill Book Co., New York, 1951.
2. T. J. Carroll: "Comlementary Diversity Reception on Microwaves," Propagation Report No. 2, OC Sig O, The Pentagon, Washington, January 3, 1954.
3. F. E. Terman: "Radio Engineers' Handbook," First Edition, McGraw-Hill Book Co., New York, 1943.

Editor's Note: A report made last year to the Petroleum Industry Electrical Association shows that the petroleum industry is making little use of diversity reception. The report, published in the February 1955 issue of the P.I.E.A. magazine Electrical News, was written by C. B. Lester and C. A. Compton of Mid Valley Pipe Line Co.

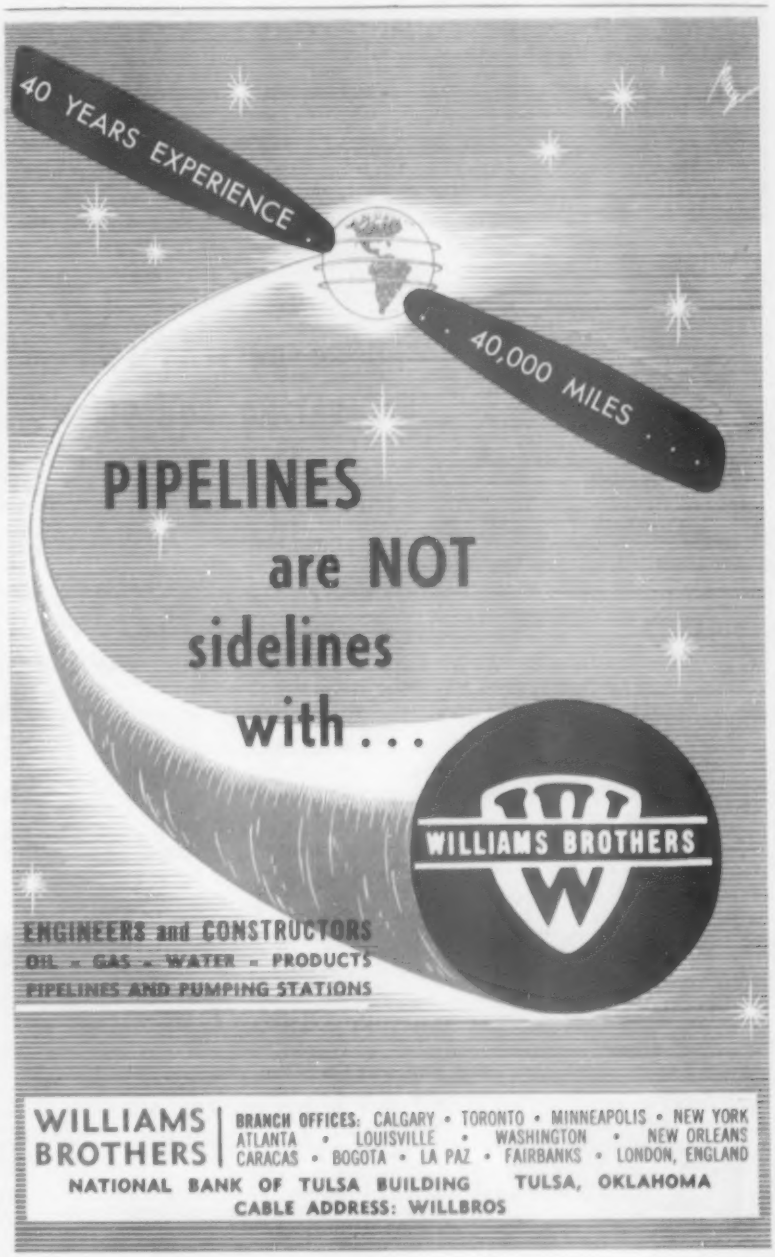
It says in part ". . . There is little user experience with diversity reception as a means to combat fading. Those who use it consider it very desirable. A few users are including it in future planning. The remainder say that they have no need for it or would use it as a last resort."

One reported use is on the pipeline system of Trunkline Gas Co. *(See The Oil and Gas Journal, January 3, 1955, page 90)*. On this system, use of diversity reception resulted in greatly improved performance. Deep fades (in the order of 30 decibels) were seen by the combined antennas for only 0.025 per cent of the total operating time. This was about a six-fold improvement over single-antenna operation.

Diversity reception when passive reflectors are used instead of parabolic antennas presents a more difficult problem. In this case the reflectors must be moved laterally on the tower so the high reflector will have a clear path into the receiving antenna.

With H-frame towers this is not such a problem. But with single towers a problem of tower twisting during high winds makes design more difficult. Setting the diversity reflectors equi-distant from the tower is obviously one step that can be taken. This is not the complete answer, however, since tower deflection due to wind load may not be completely balanced out. Best answer in this case appears to be use of horizontal arms on the tower and heavy cross-guying.

Another solution to the problem of reflection is the use of alternate high and low towers where path lengths permit. By doing this, the reflection point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can be made to occur very near the base of the low tower so that cancellation will be avoided.

Pipeline microwave use hits 11,000 miles

THE petroleum industry and particularly the pipeline industry is the biggest user by far of microwave. A recent report to the Federal Communications Commission shows that 10,969 miles of microwave system are in use as of December 1954. This amounts to over 99 per cent of the microwave system miles in use outside of common carrier.

The report was made by the Central Committee on Radio Facilities of the American Petroleum Institute. It is the result of a comprehensive study of all present systems and also gives data on systems under construction and proposed systems.

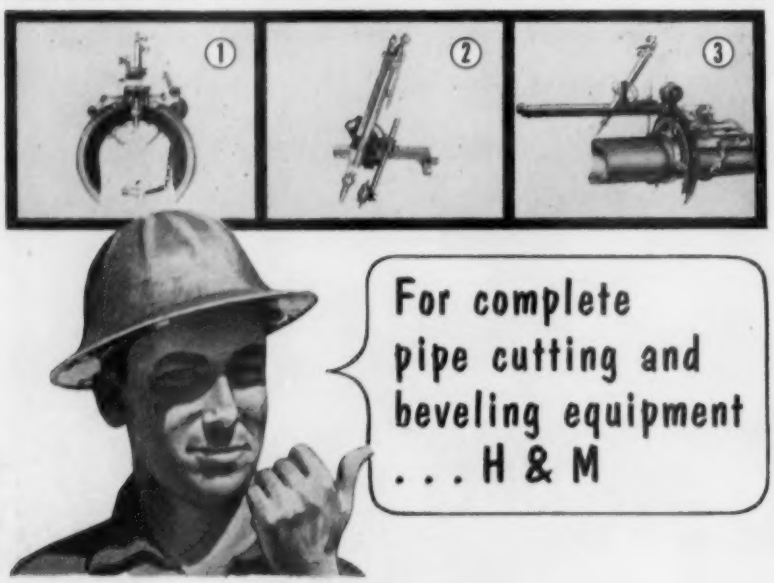
According to the report, there are now 444 microwave repeater or terminal stations. These stations are using 834 transmitters and receivers, excluding those for standby emergency use.

Over 60,000 miles of voice channels are in use, plus an additional 33,000 miles of supervisory control, telemetering, and teletype circuits. If all available channels in these systems were converted to voice use, the total mileage for "talking" circuits would be 190,144 miles.

Systems being built . . . The report covered six systems now being built for petroleum-industry service. When completed, these systems will total 1,436 miles, will have 56 stations and 100 transmitters. They will use 14,000 miles of voice channels and have an ultimate capacity of 35,000 miles.

Eleven more microwave systems have been budgeted or are being seriously considered by producing or pipeline companies. These systems would have a total length of 3,918 miles and have about 180 stations.

Other users . . . Besides the petroleum industry and the common carriers, three other industries are making wider use of microwave. The forestry industry has five systems in operation and is planning two additional ones. Railroad and aeronautical radio services account for six more systems, and companies in these two categories have plans to build four more systems. Total microwave system miles now in operation for these last three users is 347 miles. Planned systems total 1,275 miles.



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Overhead mounting saves leg room

THOUGH mobile radio units are designed to occupy a minimum of space, some pickups and trucks don't have much room to spare under the dash. This is particularly true if controls for a winch are also brought into the cab.

An easy way to solve this problem is to mount the complete transmitter-receiver package on the cab's ceiling as has been done with this unit. This type mounting leaves full seat and leg room in the cab, and is easily accessible for occasional repair, adjustment, or maintenance.

Why is Dunham Tanks forging ahead?

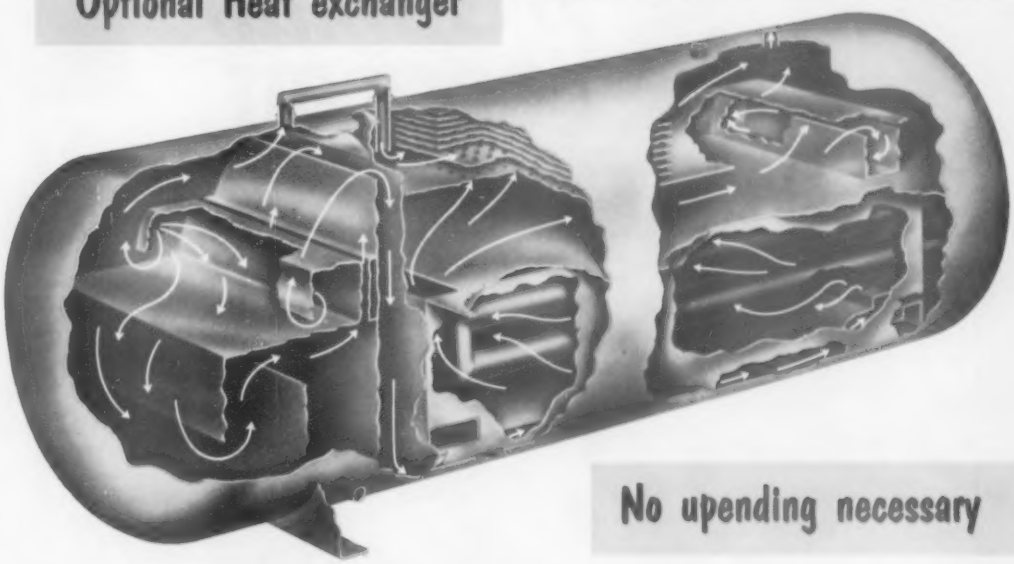
(NO. 5 IN A SERIES OF 10 ADS.)

NEW ADVANCED HT EMULSION TREATER

better because...

Completely skid mounted

Optional Heat exchanger



No upending necessary

Description of flow: The well stream enters into the free water knockout on the left side. The free water knockout is provided with its own level liquid control and motor valve.

Gas flows through the U-loop into the treating compartment. By utilizing the upper section of this compartment as a horizontal separator in conjunction with a wire mesh mist extractor element, 100% separation efficiency is obtained.

Clean oil leaves the treater at upper right, going to the shell side of a heat exchanger and then to storage.

The heat exchanger is optional and is used to warm the incoming well stream and to cool the outgoing oil.

Products:

Welded and Bolted Steel Tanks, Steel Stairways and Walkways, Vertical and Horizontal Oil & Gas Separators, Emulsion Heaters and Treaters, Indirect Gas Heaters, Cold Separation Units, Two Stage Separation Units, Gas Dehydration Units, Three Phase Separators, Free Water Knockout, Servel Refrigeration Units and LeRoi Compression Units.

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Heck, man,
I got it made!

H C Smith
ROCK BIT

Joking aside, that just about sums up how many drillers feel about H. C. Smith Bits. They like the fast digging, the straight, full-gauge hole they get from the oil-country-design of H. C. Smith Bits, such as the tooth patterns and designs worked out on the basis of actual drilling records. And these drillers particularly praise the way H. C. Smith Bits are built — the all-forged bodies, hard-faced cutter teeth and the triple bearings which keep H. C. Smith Bits on the bottom, making hole in the toughest going. Pick the right bit for the formation, they say, give it the right weight and speed, and you'll find that there's nothing to beat an H. C. Smith Bit for fast, straight, full-gauge hole and trouble-free drilling!

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as good as
the best

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BRANCHES IN ALL PRINCIPAL OIL CENTERS
IN THE UNITED STATES AND CANADA

Among the

Drilling Contractors

Cooper-Herring Drilling Co., Longview, Tex., has a new contract job under way in Kaufman County, northeastern Texas. It is a 3,000-ft. test for G. W. Mosley and L. B. Marcus at 1 Becker Brothers, in the John Pyle Survey, 4 miles west of Kemp.

Trans-Era Petroleum, Inc., Wichita, Kans., is drilling another test for Halbert & Jennings in the new productive area about 5 miles southeast of Woodrow, in western Washington County, Colorado. It is an extension test at 2 Blake, in 22-1s-55w.

Superior Drilling Co. is Humble Oil & Refining Co.'s contractor on a new 11,700-ft. operation under way in the Lucky area, southwest of Bay City, in Matagorda County, Texas Gulf Coast. Location is at 1 Huebner et al., in the E. Hall and Peter Bertrand Survey.

Orville H. Parker, Arkansas City, Kans., has a string of tools working in New Brunswick, Canada, on a six-well drilling contract with New Brunswick Oilfields, Ltd., of Mintcon, N. B. The rig is on its first hole in the $720,000 drilling project.

Bullard Drilling Co. is starting another well for Fidelity Oil & Royalty Co. in Franklin field, St. Mary Parish, Louisiana Gulf Coast. It is Fidelity's third test. The first was a dry hole, abandoned in November 1953. The second was an oil producer, completed early last year in sand at 11,865-80 ft. The new test, 2 Lucia et al. Unit 2, is projected to 13,000 ft.

Power Rig Co., New Orleans, has contracted with Forest Oil Corp. for an 11,000-ft. test midway between Ellis and Maxie fields, Acadia Parish, Louisiana Gulf Coast. Location at 2 Kerr, in 1-9s-1w, is about a mile from production.

J. C. Means, Jr., Beaumont, Tex., is moving a rig to the Hog Bayou area, on the coast of Cameron Parish, Louisiana, where he will drill a 7,000-ft. test for T. G. Markley, Baton Rouge, operator. Location lists the test as 1 Carter - Rutherford, spotted in 20-15s-6w.

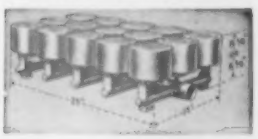
Dixie Drilling Co., Dallas, is scheduled for a deep test to be drilled for Union Oil Co. of California at a wildcat location 2 miles northeast of Gibson field, in Terrebonne Parish, southern Louisiana. The test, at 1 Cooke, in 67-16s-15e, is projected to 13,500 ft.

Tri-State Drilling Co., Laurel, Miss., has contracted for Rodessa well to be drilled for Brandon Co., also of Laurel, in Mississippi's Soso field. This will be Brandon's first operation in this field's active deep development. It is on the

Evening tour crew on deep-drilling rig H. L. Rowley, Inc., Shreveport, is operating in the Abbeville area, Vermilion Parish, coastal Louisiana. Left to right: Sam DeSoto, Jr., Duane King, Gillis Windham (driller), James M. Dickens, and Carl Roberts. Rig is on a 10,830-ft. well drilled for Bates & Cornell.

TO DEVELOP THE

MAXIMUM HORSEPOWER



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Presentation Editor . . .

Look on our masthead and you will see listed a very important member of our staff . . . the Presentation Editor.

Probably most good magazines today have his counterpart in their organization. We don't know what they call them, but the title we use certainly describes the way we think about this vitally important job around our shop.

It wasn't so long ago that magazines were proudly announcing the addition of "an Art Director." Most of these very capable men thought in terms of "decorating" the magazine rather than in terms of easier reading. We believe we are on much sounder ground when we follow the new concept of thinking in terms of improving communication rather than in terms of devices which tend to distract more than help the reader.

We still have our art department, of course, and the two together will make for the most in readership.

We hear this Presentation Editor talking about "crisp type," or about better story organization . . . or perhaps about need for more subheads and more side heads to break up the "sea of gray type." He is especially trained in this type of work, and has spent over 20 years on the problem of easier communication by typography, sketches, diagrams, charts, and photographs.

The able people who write copy for advertisements in our magazines must compete with our Presentation Editor for attention and reader time. We believe this is a healthful thing, for such competition can only result in improvements for both editorial and advertisement presentation.

We'll both benefit this way . . . for remember . . . "The reader is the most important man to both of us."

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OUR 9th YEAR
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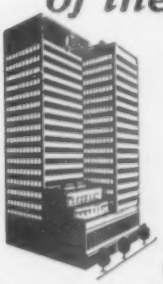

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field's north side, in Jasper County. The well is listed as 1-B Ham, in 21-10n-13w. Pay is at depths around 12,000 ft. Tri-State is completing a well in the field for Vaughey & Vaughey.

Wilson-Davis Drilling Co., Jackson, Miss., is scheduled for a new wildcat test in Wilkinson County, southwestern Mississippi. It will drill for Bona Oil Corp., of Baton Rouge, La., at 1 Board of Supervisors, in 27-4n-1e, 2 miles southwest of Rosette, and about 3 miles southwest of Freewoods field. Contract is for 7,500 ft.

Jett Drilling Co., Shreveport, will drill two Wilcox wildcat tests in Wilkinson County, southwestern Mississippi, for Virgil W. Michael and Carlos A. Greer. One, 1 Rothchild estate, in 36-2n-3w, will be 2½ miles southwest of Lessley. The other, 1 Bramlette, in 40-2n-3w, will be about 4½ miles southeast of town. Both are projected to depths around 8,750 ft. Jett has an operating interest in both.

Pioneer Drilling Co., Shreveport, is moving a light rig to a wildcat location 2¾ miles southeast of Rayville, in Richland County, northeastern Louisiana, for a 2,800-ft. Tuscaloosa test to be drilled for A. W. Phillips, of Monroe, La. Location, at 1 Rogers, in 23-17n-7e, is about 2¼ miles northeast of Big Creek field.

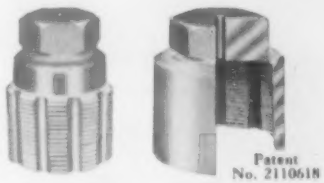
Butler-Johnson Service Corp., Bossier City, La., has a new Pettit operation under way in the rapidly developing Bethany-Longstreet area in DeSoto Parish, northwestern Louisiana. It is a contract job for Mid-Century Oil & Gas Co., of Houston, at 1 McMillon unit, in 8-13n-15w. Objective is around 6,900 ft.

Cooper-Herring Drilling Co. is putting down a projected 5,200-ft. wildcat test 10 miles northwest of Jacksonville, in Cherokee County, East Texas. It is a contracted job for H. S. Phillips and Sinclair Oil & Gas Co. at their 1 Winshipp, in the J. M. Fitzgerald Survey.

Trant Drilling Co. will drill Humble Oil & Refining Co.'s projected deep wildcat test in the Juan N. Acosta Survey, 3 miles southeast of Fallon, in Limestone County, East Central Texas. The test, listed as 1 McGillivray Muse, is set up to go to 8,500 ft.

Pegg Brothers will drill a 4,200-ft. wildcat test for E. M. Hailey at 1 Bruner, in Cruz Landin Survey 45, 10 miles west of Poteet, in Atascosa County, Southwest Texas.

TUBING
Cleanout
TAP and DIES
by Baird



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Very High Strength Wire Rope

TRU-LAY VHS will soon be the talk of men everywhere who use wire rope on the toughest jobs, as scraper ropes, drag lines, shovel hoist ropes, logging chokers, rotary drilling lines and slusher ropes.

TRU-LAY VHS *has 15% greater tensile strength than rope made of* IPS—*Improved Plow Steel. Up to now* IPS *has been the top standard rope.*

STRONGER AND TOUGHER

On jobs where the strength of wire is the big thing, VHS wins hands down. It's so much stronger that you can safely handle heavier loads with the same diameter rope; or you can use smaller ropes for the same loads.

Along with its greater strength, VHS is a tougher and more wear-resistant rope. It offers greater resistance to abrasion. *This means size for size,* VHS *rope will last longer.*

Stronger and tougher, this new rope reduces replacement time. It increases work output and cuts down the number of feet of rope needed to operate your equipment.

A NEW GRADE OF STEEL

The secret of TRU-LAY VHS rope is a new grade of steel for wire rope and a certain way of processing it. ACCO engineers and researchers have worked on this for years. Now we are confident that it is the greatest improvement in wire rope since we announced Preformed thirty years ago. Those who have used it say it is by far the best rope they've ever used...In short, it combines all the advantages of Preformed with the added strength and toughness of VHS.

Developed for These TOUGH JOBS

SCRAPER ROPES

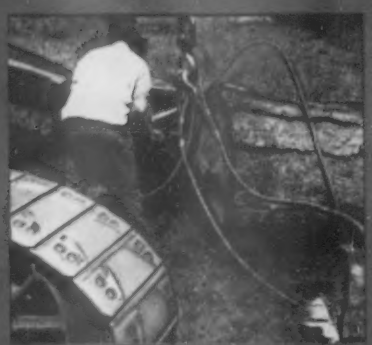
Small sheaves and drum, cross winding, dirt—all call for VHS with its higher strength, flexibility and resistance to abrasion.

DRAG LINES

Are whipped, jerked, scraped, and dragged in the dirt. But a TRU-LAY VHS drag line will carry on long after other wire ropes are torn to shreds.

SHOVEL HOIST ROPES

Continuous bending and shock loads necessitate VHS, with its high resistance to abrasion and greater strength.



LOGGING CHOKERS

Here VHS's greater strength in a small rope size means easier handling for the setter. Combined with ACCO's DUALOC endings this means the ultimate in choker ropes.

ROTARY DRILLING LINES

Stronger VHS provides additional weight lifting capacity for deeper drilling with the same size rope. And it takes rough handling and abrasion in stride.

SLUSHER ROPES

Are dragged in the dirt and crosswound on small sheaves. Service records show that TRU-LAY VHS lasts longer in this tough service—costs much less to use.

VHS is the Biggest Thing in Wire Rope Since Preformed

TRU-LAY VHS was applied to certain confidential military uses during World War II. Until very recently, military applications have consumed almost all of our available output.

However, since the war a limited quantity has been sold under close control for specific commercial uses. It was tested under the most severe service conditions and it wasn't babied. *The tests proved that it lasted longer and did more work with less shut-down time for replacement.*

These on-the-job tests proved that TRU-LAY VHS reduced service costs below that of Improved Plow Steel wire rope which, up to now, has been the highest standard grade of the wire rope industry.

Now you can get this new and better grade of Preformed wire rope —TRU-LAY VHS—for use on the types of machines illustrated above.

Ask your nearby American Cable distributor about TRU-LAY VHS or write to the nearest American Chain & Cable Company office listed below for brochure DH-489.

ACCO

TRADE MARK

American Cable Division

AMERICAN CHAIN & CABLE

Plants: Houston, Tex., Wilkes-Barre, Pa.

Offices and warehouses: Odessa, Tex., San Francisco, Portland, Ore., Pittsburgh, Philadelphia, New York, Los Angeles, Denver, Chicago, Atlanta · Bridgeport, Conn.

ARE YOU PAYING MORE THAN $200.00 FOR *ROTARY HOSE?*

LET BARNEY EXPLAIN WHY YOU SHOULDN'T

TO THE OIL INDUSTRY:

Here are some **facts** about rotary hose that are almost unbelievable.

In a nut-shell: YOU CAN ACTUALLY BUY A 55-FOOT LENGTH OF GOODALL LONG-LIFE ROTARY HOSE AT A NET COST OF LESS THAN $200.00.

Startling? Sure!

Compare these figures:

Cost of new 3 x 55 Goodall Rotary Hose with Barney Couplings	$1669.79
Out-of-pocket cost for resetting couplings	100.00
Total cost for Double-Life rotary hose service	$1769.79

OR, FOR EXAMPLE,

Take the cost of a new 3 x 55 Goodall Rotary Hose with Barney Couplings	$1669.79
ADD cost for furnishing and resetting couplings to make two 3x15 vibrator hose	250.00
Subtract normal cost of 2 new 3x15 vibrator hose @ 818.51	1637.02
Then, when the 2 sets of Barney Couplings used on the vibrator hose are returned, you are allowed a credit of $50.00 per set	100.00
NET COST TO YOU FOR 1 3 x 55 ROTARY HOSE **AND** 2 3 x 15 VIBRATOR HOSE	$ 182.77

Thus, you started with a $1669.79 investment in a rotary hose. And then, after receiving maximum service, you get a renewed rotary hose for only $100.00 or 2 vibrator hose with a value of $1637.02. Therefore, your out-of-pocket money, with Goodall Rotary Hose, is less than $200.00. (The 3 x 15 vibrator hose is used as an example, any length hose can be furnished).

No other rotary hose manufacturer can offer you this type of bargain in rotary hose . . . because no other rotary hose manufacturer has the Barney Coupling that can be reset to save your hose from the scrap heap. Specify Goodall to your supply store. It's available through all stores, now, wherever you operate.

Thanks,
Barney

*This advertisement rerun by request. Additional copies available.

GOODALL RUBBER COMPANY
TRENTON, N. J.

GOODALL RUBBER COMPANY OF TEXAS: Houston, Odessa, San Angelo, Texas.
GOODALL RUBBER COMPANY OF CALIFORNIA: San Francisco, Los Angeles, Seattle, Salt Lake City, Portland.
GOODALL RUBBER COMPANY: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit.
EXPORT: Goodall Rubber Company, Trenton, N. J.
STOCKING DISTRIBUTORS: Texas and Louisiana — Houston Oil Field Material Co., Wilson Supply Co., Hunt Tool Company, Harries Sales & Rental Co. Oklahoma — Iverson Supply Co. Kansas — Mountain Iron & Supply Co.

Save Time

. . . Use These Handy Time-Saver Cards

Want more information on products advertised in this issue? Or do you want to know more about the items described in the "New Equipment Section"? Or would you like some of the literature here mentioned?

Let us get it for you

Just use the convenient prestamped cards on this page. We'll forward your requests promptly.

To The Oil and Gas Journal: Please send me further information, without obligation, on items of New Equipment or Bulletins I have checked (✓) from your issue of March 28, 1955

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Check here FOR NEW EQUIPMENT or LITERATURE

Mark here FOR MORE INFORMATION ON ADVERTISED PRODUCTS

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The cards shown here are supplied for your convenience. Just ✓ ✓ ✓ check the circle with the number of the item in which you are interested, tear off the card, and drop it in the mail.

We do the rest

If you want additional information on any product advertised in this issue, note the page number on the card.

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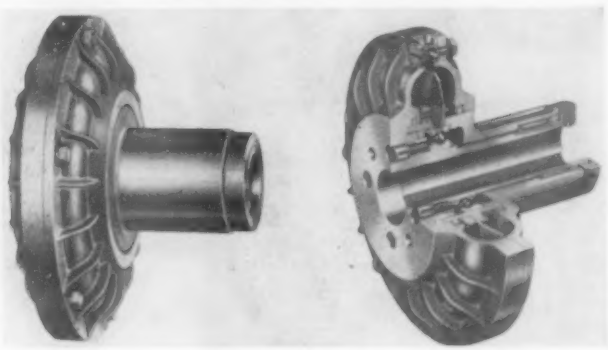
(No postage required)

. . . What's New in Equipment?

Use the handy Time-Saver Cards ✓✓✓ to obtain additional information on these items

by Dan B. Miller

Flexidyne Is New Dry-Fluid Drive



A new development in industrial power transmission, called Flexidyne, is described as a dry-fluid drive. Flexidyne easily handles difficult starting and reversing problems, and gives a new kind of protection against shock and overloads. Its major advantages are based on the fact that at normal operating speeds it does not slip. At the same time, in the case of an overload, it is slippage which gives protection.

It has wide application for industrial drives involving heavy inertia and shock loads on such equipment as compressors and oil-field machinery.

The Flexidyne drive is made up of a housing, inside of which a rotor is free to turn concentrically. Between the two are fine particles of spherical steel shot, called the flow charge, which acts very much like a fluid. It is the flow charge which transmits power from the housing to the rotor. This flow charge is easy to seal in, has a high density, and can stand relatively high temperatures.

The amount of the flow charge determines the torque capacity. Because it is easy to vary the amount of this charge, the Flexidyne will give the exact starting torque needed for anything from the smoothest to the fastest start.

Accurate overload protection is assured as the Flexidyne can be set to slip at anywhere from as low as a gentle 20 per cent over full-load torque to as high as peak-motor torque. During starting and overload periods the current draw is at a minimum because with the standard Flexidyne setting the motor is never pulled down to less than 90 per cent of synchronous speed. *Dodge Manufacturing Corp.*

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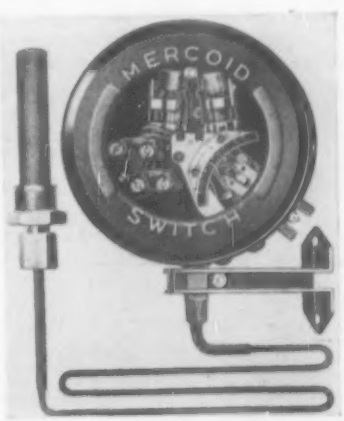

New Temperature Control Provides Staged Operation

A new two-stage temperature control provides the advantage of staged operation from a single-actuating bourdon tube. The control incorporates two independently adjustable magnetic-mercury switches which provide for successive stage operation or high-low operation.

The controls can be furnished in 11 different operating ranges. They are equipped with external adjustments and a visible calibrated dial. The switches are sealed magnetic-mercury types. The standard steel case conforms to NEMA 1. Weatherproof cases (NEMA 1A, 2, 3, 4) and explosionproof cases (Class 1, Group D, or Class 2, Groups E, F, and G) are available. *Mercoid Corp.*

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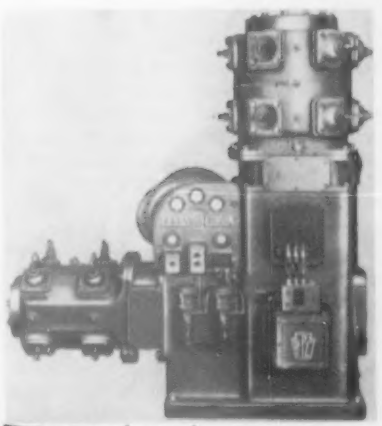

Duplex Compressor Features Compactness, Portability

A duplex compressor designated as Class HAE is of two-stage, heavy-duty, water-cooled, angle-type design. It is made in two capacities—either 797 or 974-cu.-ft. per minute piston displacement. They are rated at 125 and 150 hp.

Outstanding features are compactness, portability, and flexibility of installation by virtue of reversible intake and discharge openings located on distance pieces. Intercooler tubes are replaceable. Full-pressure lubrication is obtained through rifle-drilled passages to all internal bearing surfaces. Main bearings are of the spherical-roller type. *Pennsylvania Pump & Compressor Co.*

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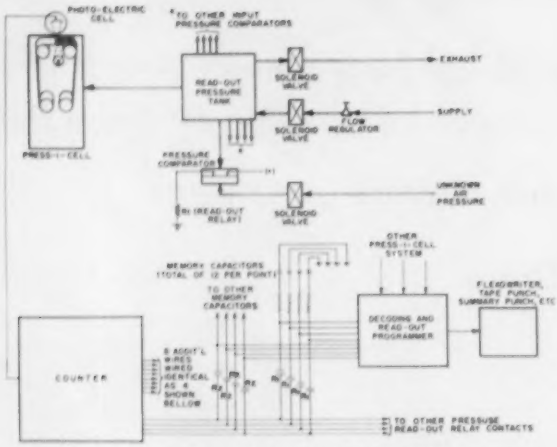
What's New... Use the handy Time-Saver Cards



MULTIPLE PRESSURE READ-OUT SYSTEM

Readout System Scans 200 Points

It is now possible to measure up to 200 pressures at a given instant and to read out digital values—accurate to 1 part in 2,000—of all measured pressures within 2 minutes of the time the pressures were sensed. Such simultaneous measurement of pressures, with rapid information presentation, will prove valuable to operating and research personnel in process industries. This performance is a reality with the multiple-pressure readout system.

Expensive, time-consuming manual logging is eliminated by the system. So is the time lag, often many hours or days, that used to exist between measurement of data and conversion to usable form The data produced with the new system are even more reliable than those produced by former methods because the potential human error has been removed. Initial instrumentation costs and future maintenance costs are minimized by the use of a single sensing device for all measurements and a "yes-no" electrical system requiring no critical voltage adjustments.

The system consists of a number of pressure comparators, each of which receives—on the signal side of its diaphragm—one of the pressures which must be sensed. The other side of each comparator is connected to a manifold common to all the comparators, in which a pressure "sweep" is introduced. The simultaneous-sensing feature of the unit is accomplished by having all signal pressures sealed in the comparator by electrically actuated solenoid valves.

The pressure-measuring instrument is the Press-I-Cell. This unit features pressure capsules, a differential-transformer pickup, and a Servo-positioned, 200-in. film scale. *Fischer & Porter Co.*

Check No. 4 On The Time-Saver Card

●

Stainless-Steel Fittings Made for Corrosive Service

These new 150-lb. stainless-steel pipe fittings are ideal for standard pressure services where corrosion is a factor. They are available in screw-end and socket-welding types in stainless steel Type 304 and Type 316.

Type 304 stainless steel, with a chromium content of 18 per cent and nickel 8 per cent is highly resistant to corrosion and high-temperature oxidation. Type 316 stainless steel has a chromium content of 18 per cent, nickel 11 per cent, and molybdenum 2½ per cent. Properties are similar to Type 304 except that the higher nickel content and the addition of molybdenum increase the corrosion resistance in a wide variety of services.

The lightweight fittings are available in sizes ⅛ to 2 in. The smaller sizes are machined from solid forgings. Larger sizes are manufactured from high-quality stainless-steel castings. The screw-end fittings feature perfectly aligned, accurately cut threads, and smooth bores. The socket-welding fittings provide tight, trouble-free joints and are easy to install. The sockets support and align the pipe for welding. *Watson-Stillman Fittings Division, H. K. Porter Co., Inc.*

Check No. 5 On The Time-Saver Card

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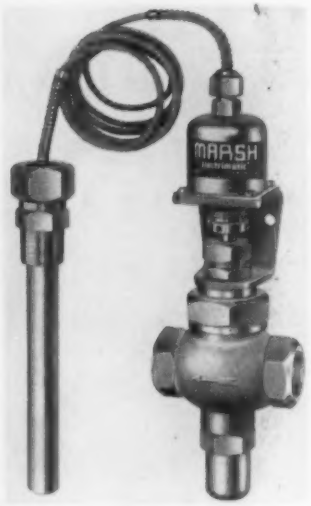


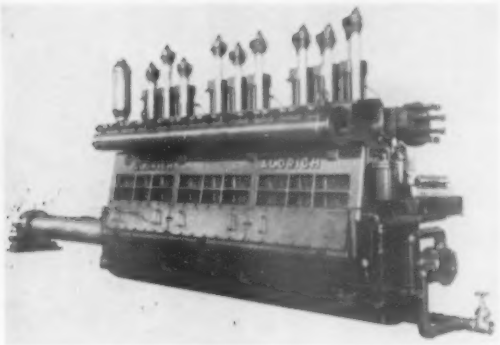
Two New Valves Are Temperature-Actuated

Two new temperature-actuated valves have been developed. Type WT is designed to control the flow of water, brine, oil, air, gas, or other fluids used in cooling and other industrial processes. The valve opens with a rise in temperature and closes with a drop in temperature. It is available in direct-operated sizes of ⅜, ½, and ¾ in. and in pilot-operated sizes of 1, 1¼, 1½, 2, 2½, 3, and 4 in. Standard temperature ranges are 20° to 60° F., 60° to 100° F., 100° to 140° F., 140° to 180° F., 160° to 220° F., and liquid pressure range is to 150 lb., steam limited to 15 lb.

Type HT is used to control the flow of hot water or low-pressure steam used in heating or other industrial processes. The valve closes with rise in temperature and opens with fall in temperature. Its main application is in heat exchangers and in heating, but may also be used as a bypass control in cooling and process service within the temperature limits of the valve. Temperature ranges and fluid pressure ranges are the same as in the WT valve. Connection sizes available in the direct-operated type are ⅜, ½, and ¾ in., and in the pilot-operated type 1, 1¼, 1½, and 2 in. *Electrimatic Co.*

Check No. 6 On The Time-Saver Card

What's New... Use the handy Time-Saver Cards



Nonuplex Is for Heavy-Duty Pumping

A new line of 6-in. stroke Nonuplex, direct-flow pumps is for heavy-duty pumping applications. These nine-plunger reciprocating pumps offer advantages of positive displacement, high-speed operation, compact construction, interchangeability of parts, low maintenance, and minimum-discharge variation.

Rated at 900 b.hp., Nonuplex pumps operate at speeds up to 300 r.p.m. and have pumping capacities up to 1,520 g.p.m.; or 52,000 bbl. per day. They are available with six different, interchangeable fluid ends and 20 different plunger diameters. Plunger diameters range from 2 to 5¼ in. in increments of either ⅛ or ¼ in. Changes in speed and plunger sizes permit a wide range of pumping capacities and so give any desired intermediate throughput.

These pumps are suitable for drive by engine or synchronous-engine-type motor. The crankshaft is located near the floor. Nonuplex pumps feature direct-flow fluid ends and inverted design for compactness and ease of maintenance. The direct-flow design permits straight-line flow through the working barrel, which results in an improved volumetric efficiency and a reduction of loss space in the fluid end.

The design of the pump reduces to a minimum the discharge flow variation (pulsation) normally associated with reciprocating pumps. *Aldrich Pump Co.*

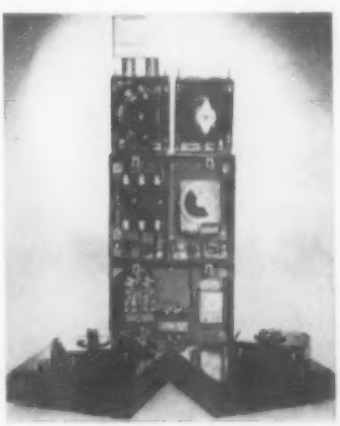
Check No. 7 On The Time-Saver Card

●

Armored Plastic Encloses Pump-Control Units

The design of these oil-well-pump motor units advances a number of innovations. Each control is made up of a number of components openly mounted in an armored plastic enclosure to allow for fast field repair or replacement when necessary. The particular control shown is a size 1, Type 174, designed to handle 15 hp. on three-phase 440-volt line. Durable magnetic contactors, adjustable overload relays, and three-pole connections allow for full motor protection. Time clocks can be used in the starters providing for 15-minute pumping schedules and skip-a-day features.

The armored plastic is moisture and dustproof, and fire and corrosion resistant. It will not absorb gases, has no paint to burn or wear off, and is lightweight. These controls are easy to install with two pole-mounted brackets.



Line and motor terminals are readily accessible through two hubs provided in the enclosure. Externally grounded controls are available with lightning arrester on outside of enclosure. *Klockner-Moeller Corp.*

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Truck Tracks Made To Fit Most Tire Sizes

Truck tracks like these have been widely adopted by truckers and contractors facing difficult terrain problems with trucks, tractors, cranes, and similar rubber-tired, heavy equipment.

These truck tracks fit most tires, are easy to mount, give up to 500 per cent greater flotation, and are quickly and easily adjusted to various size tires and road conditions. They are supplied in standard tracks of 15 in. for single and tandem axles. Heavy-duty, 18-in. tracks are also available for many larger-size tires. *P. & G. Supply Co.*

Check No. 9 On The Time-Saver Card

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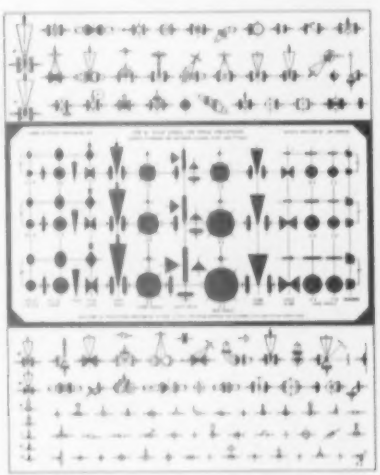

Piping Indicators Are Made For Plant Design Engineers

Cassel ⅜-in.-scale, single-line piping indicators are designed for 150-lb. pipe and valve indications. Indicator No. 271 is for ½ to 3-in.-o.d. pipe and No. 273 for 4 to 8-in.-o.d. pipe. They are accurately made to scale for engineering drawings of oil refineries, petrochemical plants, oil and gas pipelines, chemical plants, and other pipeline industries. *Graphic Indicator Co.*

Check No. 10 On The Time-Saver Card

Short Length... Long Service

GUIBERSON AF PACKER

for acidizing, flooding, fracturing and other below packer pressure operations

The solid head packer you've been wanting a long time and at a price you'll be glad to pay. The AF is short, compact, strong and reliable in operation. Positive seal of pressure below the packer at any depth. Design features include friction pads, automatic latch and dove-tail slips and head. Special rubber has built-in ability to return to original shape. It will not vulcanize to casing wall and is acid, oil and gas resistant. Best of all, here is a packer you can handle—in the well or out! Over-all length of 5½" or 7" size is less than four feet!

See this packer at your favorite supply store.

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- Bulletins
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Far More Reasons Than One. A new brochure features information on how the use of Foamglas cellular-glass insulation solved the severe insulating problems of leading users. The brochure, profusely illustrated with photographs shows application of Foamglas to insulate roofs, ceilings, walls, and floors of all kinds of buildings, piping, tanks, and equipment. *Pittsburgh Corning Corp.*

Check No. 11 On The Time-Saver Card

●

Protective Coatings. Bulletin No. 7-2 devotes two pages to each of Atlas' standard coatings. Included in the bulletin are neoprene heavy-duty, neoprene extra-heavy-duty, styrene, chlorinated-rubber, and epoxy-resin-based coatings. *Atlas Mineral Products Co.*

Check No. 12 On The Time-Saver Card

●

Poro-Scope. The first in a regular series of news bulletins on porous media and filtration engineering contains two discussions of major importance; one on a new technology which makes possible low-cost, porous stainless-steel filters, the other on filter area and its significance in filter purchase. Poro-Scope will be published bimonthly and sent to research, design, development, and process engineers, and other interested people in the process industries. It is designed not only to provide news of the filtration field but also as a forum for discussion of all phases of filtration and gas dispersion. *Pall Filtration Co.*

Check No. 13 On The Time-Saver Card

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Ground Resistance and Soil Resistivity Measurement. Revised Bulletin 1-2 describes the complete Vibroground line of portable field instruments for measurement of ground resistance. Also included in the eight-page, two-color bulletin are instructions and schematic diagrams illustrating proper field application of this instrumentatiton. Eight Vibroground models are covered for application in checking resistance to ground of grounding rods, grids, struc-

RODINE 203

ACIDIZING INHIBITOR

provides positive protection for well tubing and acid storage equipment at high or low temperatures.

"Rodine" 203 is an organic inhibitor designed especially for acidizing.

It is neither destroyed nor precipitated by hydrogen sulfide. It does not stimulate localized pitting. It is readily soluble in water or acid.

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Flat Bore—Mercury Filled—Engraved Stem—with 18-8 stainless steel stems. Chromium-plated case to resist corrosion and dirt. These midget industrial thermometers are recommended for equipment requiring Small Armored thermometers . . . and where large industrial thermometers are inappropriate.

An economical instrument . . . because thermometers may be replaced "on the job" . . . that is—refill can be inserted into Armored Case without difficulty . . . eliminates necessity of sending instrument to factory for thermometer replacement. Assured Accuracy.

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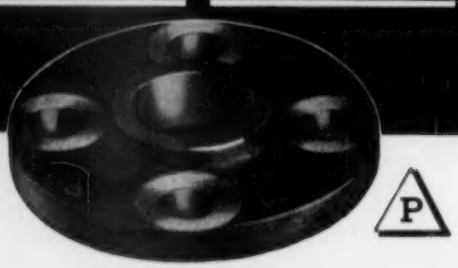

Long life is assured with Phoenix maximum strength flanges. Forged of mild steel, they are available in a wide range of styles and sizes. Meet ASA requirements and ASME and ASTM specifications.

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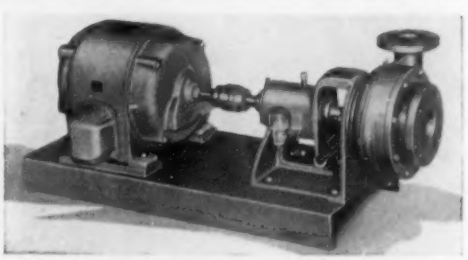
SALT WATER DISPOSAL

An alloy proven in oilfield service; available in a standard pump . . .



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26 Sizes ● Heads to 200 Feet
Capacities to 2000 GPM

Worthington CNG Pumps are made of WORTHITE, a highly-stainless alloy. Proved, outstanding resistance to oilfield corrosion. Flanged nozzles, rugged frame, cantilever shaft. Designed for reliable service. Complete units and spares carried in stock.

Bulletin W-350-814A sent on Request

A. M. LOCKETT & COMPANY, LTD.
HOUSTON NEW ORLEANS DALLAS

tures, and measurements of soil resistivity in conjunction with corrosion control, cathodic-protection studies, and earth resistivity measurements for geophysical prospecting. *Associated Research, Inc.*

Check No. 14 On The Time-Saver Card

●

Buckchurch Suspension Buildings covers a large amount of data on construction and engineering principles involved in the design of sectional buildings for warehousing or for housing plant equipment. Specifications are included for four standard models. The cover photograph illustrates the unobstructed interior of these buildings. *Buckwyn Contructions, Ltd.*

Check No. 15 On The Time-Saver Card

●

Perforated Metals for screening, grading, cleaning, sorting, and filtering requirements are illustrated in Catalog 860. Illustrations and specifications cover every conceivable pattern of perforation, including round and square holes, round-end slots, square-end slots, diagonal slot perforations, lipped perforations, and embossed patterns. *G. A. Harvey & Co., Ltd.*

Check No. 16 On The Time-Saver Card

●

Flaw Location by Dye Penetrants is the title of a 12-page booklet which describes in detail the Turco Dy-Chek inspection method. It also offers helpful suggestions on how to perform inspections on any metal by the dye-penetrant method. The Dy-Chek method of flaw location is basically a hide-and-seek process. Following cleaning, a red dye penetrant is applied to the surface being inspected. After being allowed to dwell long enough to hide in any flaw, the excess penetrant is removed from the surface. A white developer is then applied to the surface. This developer seeks out the penetrant hidden in the flaw. As the developer dries, it pulls the hidden penetrant to the surface of the part. *Turco Products, Inc.*

Check No. 17 On The Time-Saver Card

●

Joy Packaged Gas Compressors. This eight-page, two-color bulletin No. A-94 shows illustrations of several installations of Joy gas compressors in operation in such duties as gas gathering repressuring, and gas lifting. Cross-section views of two compressor models point out features. Four basic frame arrangements are illustrated showing ratings up to 400 hp., and indicate single or multistage compression with from one to four cylinders ranging in size from 3 to 13½ in. *Joy Manufacturing Co.*

Check No. 18 On The Time-Saver Card

●

Engineering Data, Viking Rotary Pumps. Section K of this rotary-pump series contains selecting tables, rotary-pump fundamentals, a viscosity conversion chart, and a series of tables and charts dealing with such subjects as specific gravity, number of gallons in round tanks, pressure-loss conversion into feet head of water, equivalent values of pressure, conversion of Fahrenheit into Centigrade, single-acting cylinder displacement, and resistance of valves and fittings to flow of fluid. *Viking Pump Co.*

Check No. 19 On The Time-Saver Card

●

Sparkproof Aluminum Floor Grating and Stair Treads. File 14-R, Issue No. 1-A features a safe-load table and also illustrates standard-spaced aluminum grating. For specification and design needs, a table of panel widths is included. *Kerrigan Iron Works, Inc.*

Check No. 20 On The Time-Saver Card

*WHEN A ROTARY WON'T DO

Duplex, double-acting reciprocating power with interchangeable liners in ¼" graduations —V-belt driven.

- 8 H.P. SMALL VOLUME
- 1000 LBS. W.P.
- POT TYPE FLUID END
- HELICAL GEARS
- BUILT-IN GEAR REDUCTION
- NO ROD OVERLAP
- LARGE VALVE AREA
- INTERCHANGEABLE LINERS

	GEAR RATIO 6.857 1¼" to 3" x 3"				WEIGHT 700# PLUNGER LOAD 2400 LBS.			
	100 RPM				125 RPM			
LINER	GPM	BPH	PSI	HP	GPM	BPH	PSI	HP
1¼"	11	15	1000	8	14	20	1000	10
2"	15	21	760	8	18	26	760	10
2¼"	19	27	600	8	24	34	600	10
2½"	24	34	490	8	30	43	490	10
2¾"	30	42	400	8	36	52	400	10
3"	35	50	340	8	44	62	340	10

*Priced to compete in rotary pump class where the initial investment is our primary concern, and yet this pump is built to last a lifetime! For water-flooding and salt water disposal available in bronze fluid ends or bronze mounted.

Available Through:
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D. T. O'CONNOR
WHEATLEY EQUIPMENT, LTD.
FRANKLIN SUPPLY CO.

FRANK WHEATLEY
PUMPS & VALVES
TULSA 6, OKLAHOMA

EQUIPMENT MEN . . . in the News

From left to right—J. A. Conlon, vice president, New York Belting & Packing Co., and F. I. Brinegar, executive vice president, Continental.

From left to right—J. A. Mussler, general manager of sales, Continental, and L. A. Dixon, Sr., executive vice president, Rockwell.

Continental Supply's 15th Annual Sales Meet

F. M. Mayer, president of Continental, is shown at left greeting a party from Youngstown Sheet & Tube Co., upon their arrival for Continental's annual sales meeting. Second from left is A. S. Glossbrenner, Youngstown vice president; next, M. H. Watkins, vice president; and J. L. Mauthe, president.

. . . Attracts Manufacturing Executives

Continental Supply Co.'s fifteenth annual sales meeting was held in Dallas, March 6, 7, and 8. The meeting, held in the Baker Hotel, was attended by representatives of Continental's associated manufacturers and by 260 Continental men from the United States and from the company's foreign points.

Business sessions of the meeting were devoted to discussions on various phases of merchandising with special meetings held for specialists in drilling equipment, production equipment, and tubular goods.

J. L. Mauthe, president of Youngstown Sheet & Tube Co., Continental's parent organization, was among the guests present, along with M. H. Watkins, vice president and A. S. Glossbrenner, vice president. Among other associated companies' officials present were: J. H. Bascom, executive vice president, Broderick & Bascom Rope Co., E. M. Rhodes, manager, Roller Chain Division, Chain Belt Co.; George B. Flanigan, manager trade relations, Chain Belt; T. Bruce Cox, manager Union sales, Clayton Mark & Co.

W. T. Powell, president, Emsco Manufacturing Co.; W. C. Kinder, vice president and general manager of sales, Emsco Manufacturing; G. V. Leece, president, Gardner-Denver Co.; A. H. Jones, vice president, Gardner-Denver; A. G. Lindquist, vice president, Gardner-Denver.

J. F. Hacker, vice president, Ladish Co., Paul M. Arnall, president, Lunkenheimer Co.; Martin Walter, Jr., president, New Bedford Cordage Co.; Robert A. Snyder, vice president, New Bedford Cordage; J. A. Conlon, vice president, New York Belting; L. A. Dixon, Sr., executive vice president, Rockwell Manufacturing, Nordstrom division; C. K. Madison, vice president, Rockwell Manufacturing, Nordstrom division; H. H. Peters, president, Technical Oil Tool Corp.; and E. G. McConnell, vice president, Technical Oil Tool Corp.

F. M. Mayer, president, and F. I. Brinegar, executive vice president, welcomed the group at the opening of the business session Monday morning. J. A. Mussler, general manager of sales, was moderator during the 2-day general sales meeting.

The annual 25-Year Club dinner was one of the highlights of the meeting. C. H. Fischer, district manager, Evansville, Ind., was elected president for 1955. Howard D. Nesbit, Dallas city sales, was elected vice president; and T. M. Heraty, Drilling Equipment Division, Dallas, secretary.

Meeker Joins Orbit At Odessa Branch

D. O. MEEKER

Don O. Meeker has joined Orbit Valve Co. and is being transferred to Odessa, Tex., where he will headquarter, according to R. G. Cole, general sales manager for Orbit. Meeker will work under the direction of Orbit Valve's regional sales manager, Henry C. Sawyer, Midland, Tex.

Santa Fe Appoints De Flon As Division Chief Engineer

The appointment of James G. De Flon as chief engineer in the cooling tower division for Santa Fe Tower & Tank Co., Inc., has been announced by L. R. Obert, vice president and manager.

De Flon, who has been engaged in research, development, engineering, management, and sales in the cooling tower industry for the past 15 years, augments Santa Fe's present engineering staff. Widely known for his author-

Welcoming James G. De Flon, second on left, to the Santa Fe Tower & Tank Co., Inc., is L. R. Obert, vice president and manager. Joining in the welcome are A. M. Kuehmstead, left, vice president in charge of engineering, and J. M. Slough, sales manager.

Double Safety

for your drill string

the protection of 2 tools the simplicity of 1

The Shaffer-Waggener Bumper Safety Joint is the *only* tool of its kind—the ONE tool combining both *down-jarring* and *releasing* actions—each a separate operation under full control of the operator. In addition, this *one* tool provides other vital advantages *found in no other tool, or combination of tools!*

TO RELEASE, *tool is tripped, moving drive keys downward.*

1 **RUN THE TOOL IN THE DRILL STRING** — it's specifically designed to withstand the continuous torque vibration of modern drilling operations. The tool has been used successfully throughout the world — and at world-record depths. At all depths it provides the extra safety of double drill string protection!

2 **TO USE FOR JARRING,** simply slack off weight of approximately 2,000 feet of drill pipe onto the tool. This weight releases the tripping mechanism and strikes a sharp downward blow. Raising the string automatically re-sets the tool for another blow—and repeated blows can be struck as fast as the string can be raised and lowered. *It's as simple and positive as that!*

3 **TO RELEASE,** in the event jarring will not loosen the stuck string, simply trip the tool and apply reverse torque as the string is slowly raised. One-sixth turn of the drive keys rotates them into an unlocking slot so that complete release is obtained by continuing to raise the string.

LEFT TORQUE *then rotates drive keys into unlocking slot as string is raised.*

4 **THE TOOL TRANSMITS TORQUE LOADS** *in either direction* through drive keys—not through threads—*a big advantage* over conventional safety joints. In fact, until the definite releasing operations are performed in proper sequence, the tool remains the strongest joint in the drill string. Yet by first tripping the tool, it can be quickly released.

5 **THE TOOL CAN BE RE-CONNECTED** in the hole by simply using the recovered portion at the bottom of a fishing string for mating with the portion left on top of the fish. It's simple, quick!

Locked Position (for drilling) *Tripped Position*

Records like these provide added proof that the Shaffer-Waggener Bumper Safety Joint safeguards your drill string—and your well—as no other tool does . . .

Drill string was released from stuck drill collars at a depth of 18,136 feet, requiring only 2¾ turns of reverse torque *at the table.* The recovered portion of the Bumper Safety Joint was then run back into the hole on a fishing string, easily reconnected to the fish, and the drill collars and bit jarred loose *approximately 3½ miles down,* leaving a completely clean hole.

On another job at 16,883 feet, a Shaffer-Waggener Bumper Safety Joint being run in the drill string simplified complete recovery of a parted and dropped drill string, again leaving the hole completely clean.

Slant holes—a problem with conventional safety tools—are handled in stride with the Shaffer-Waggener Bumper Safety Joint. Even directionally-drilled wells with extreme slant offer no problems.

Send for this free 8 page bulletin which gives the full story on the revolutionary Shaffer-Waggener Bumper Safety Joint. You will find this safety data helpful.

SHAFFER

HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

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FARMINGTON, NEW MEXICO, Shaffer Tool Works, Post Office Box 546
CASPER, WYOMING, Shaffer Tool Works, Post Office Box 1788
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32 years OF OIL TOOL LEADERSHIP

ship of cooling-tower section of Perry's "Chemical Engineers Handbook" and Kent's "Mechanical Engineers Handbook," De Flon has had experience in the design, construction, and operation of cooling towers in Europe as well as in the United States.

Lane-Wells Makes Changes In Gulf Coast Division

Lane-Wells Co. has made the following changes in the Gulf Coast division, according to John J. Neale, president.

Jerry Maurice, formerly truck - station superintendent at Falfurrias, Tex., has been promoted to station superintendent at Haskell, Tex. The Falfurrias station has been closed. Harry Johnson, previously station superintendent at Haskell, has been transferred to Gainesville, Tex., as station superintendent there.

Nathan Milliman, formerly station superintendent at Gainesville, has been transferred to Hobbs, N. M., in an operating assignment.

J. E. Irving Heads Western Division, Irving Grating Co.

J. E. IRVING

A special meeting of the board of directors of Irving Subway Grating Co., Western Division, in Oakland, Calif., was held recently to appoint new officers in the company. James E. Irving was elected president of the Western Division to succeed J. C. Lynn, who died December 14, 1954.

Charles M. Thomson, formerly vice president and division manager, was appointed executive vice president of the Pacific Coast plant. Robert H. Salisbury was appointed to the position of manager of sales. He has been with the Western Division for the past 9 years.

Irving will carry out his responsibilities as president, Western Division, in addition to his current duties as executive vice president of the parent company.

He started with the company at the Long Island City, N. Y., plant in 1937 as a salesman, and has advanced steadily in position since that time. In 1942 he assisted in establishing the first Western Division branch plant. Irving is the son of Walter E. Irving, president and founder of the organization.

The company has complete facilities for manufacturing all types of industrial grating, and services the 11 western states, Hawaii, and Alaska.

Caterpillar Entertains Canadian Pipeliners

Present at the recent meeting of Canada's Pipeline Contractors Association were W. A. Rose, Anderson International Construction; Donald Coonan, Caterpillar Tractor; A. E. Seydler, Anderson International; and W. M. Aldridge, Majestic Construction, Ltd.

Caterpillar Tractor Co. was host at a luncheon at the recent Pipeline Contractors Association of Canada's first annual convention held in Victoria, B. C. The affair was highlighted by the company's introduction of its new 130,000-lb. capacity No. 583 Pipelayer and a new mobile Twin-Arc welder especially designed for pipeline work.

The luncheon preceded an address on oil and gas development in Canada by R. H. C. Harrison, president of the Canadian Petroleum Association.

Representatives from three Caterpillar dealerships, Finning Tractor & Equipment Co., Ltd., Vancouver; Hewitt Equipment Ltd., Montreal; and Union Tractor & Equipment Co., Ltd., Calgary, were on hand to discuss the merits of the company's new pipeline units.

Present from Caterpillar were Frank McNamara, assistant sales manager, northwest division; Ralph Beany, district representative for that division; James Kirkman, earthmoving representative, Donald Coonan, pipeline representative, and Carter Bucy of the sales promotion department.

Keller Made Vice President Of General Geophysical

R. F. KELLER

Raymond F. Keller, general manager of Canadian operations, General Geophysical Co., has been appointed a vice president, according to an announcement by Chester Sappington, board chairman, and T. O. Hall, president.

Keller was employed by General Geophysical Co. as second computer immediately after graduation from college, and was promoted to party chief in January 1944. His promotion to supervisor came in August 1949, when he took charge of General's Canadian department.

Beckman Advances Danforth To Sales Promotion Manager

Arnold O. Beckman, Inc., manufacturers of oxygen analyzers and other instruments for science and industry, has announced the advancement of S. C. Danforth to sales promotion manager, effective immediately.

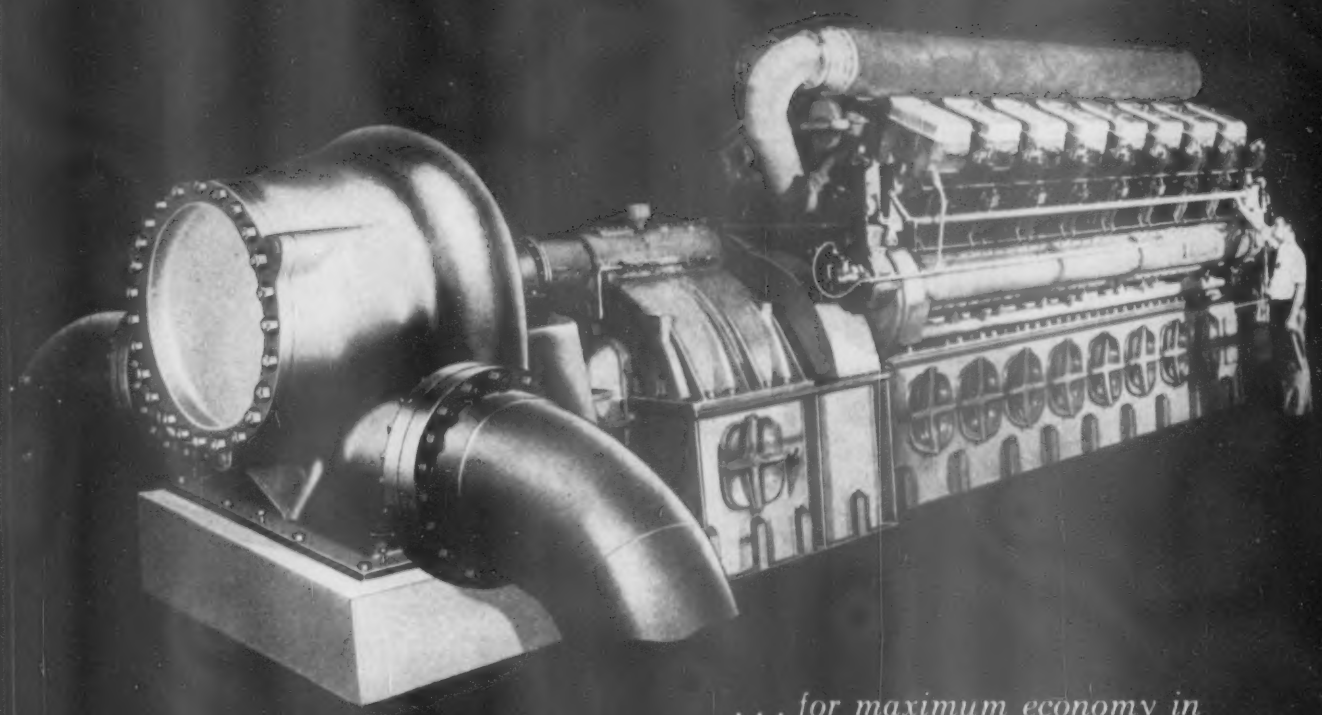
Before joining Beckman, in 1951, Danforth joined Hibbard, Spencer, Bartlett & Co. in Evanston, Ill., where he spent a considerable period in sales work before moving to California.

Since joining the Beckman organization as a technical writer, Danforth has not only been instrumental in the preparation of product and operation data, but has also done extensive research in various phases of sales and application aspects of the company's products. In his new position, Danforth will have charge of the planning and preparation of operating manuals and similar technical data for the various Beckman products.

Industrial Controls to Handle Norelco Products

The Research & Control Instruments Division, North American Philips Co., Inc., Mount Vernon, N.Y., has announced the appointment of Industrial Controls, Inc., Tulsa, as an authorized distributor.

Industrial Controls is managed by L. C. Cronberger and Jack Houston, and the organization will serve Philips customers in Oklahoma, Arkansas, and part of Kansas.



. . . for maximum economy in Gas Pipe Line service . . .

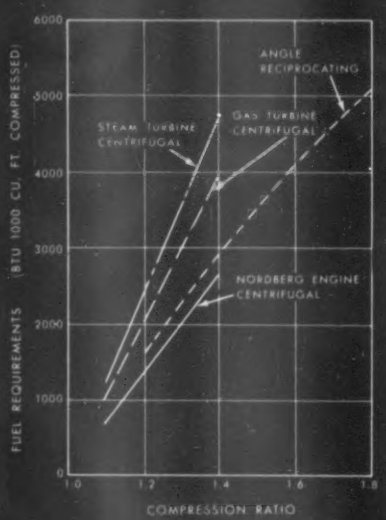
THE NORDBERG *SUPAIRTHERMAL*®

ENGINE-DRIVEN CENTRIFUGAL COMPRESSOR UNIT

Here is the latest development in compact, dependable power for maximum efficiency and economy in gas pipe line transmission service . . . *The Nordberg Supairthermal Engine-Driven Centrifugal Compressor Unit.*

Through use of exclusive design principles, the Nordberg *Supairthermal* spark-ignition gas engine operates at better than 40% thermal efficiency — with correspondingly lower fuel cost, increased horsepower, lower lube oil consumption, and lower maintenance costs per horsepower hour. The *Supairthermal* engine drives the compressor through a close-coupled speed increasing gear mounted on the bedplate extension of the engine.

Here, then, is an extremely compact, efficient engine-driven compressor unit which can be installed at low capital investment and operated at lower cost per horsepower than any other type of gas pipe line prime mover.



Savings of thousands of dollars per day in fuel costs on large gas pipe lines can be realized with the Nordberg engine-driven centrifugal gas compressor unit because this unit requires less fuel to compress gas than any other modern type of equipment of comparable capacity.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK-IGNITION GAS ENGINES

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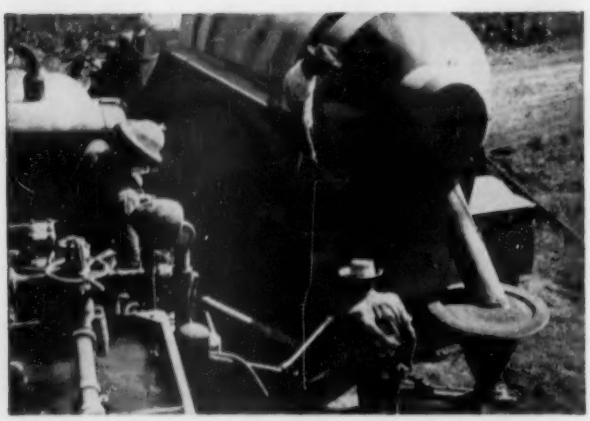
TOP quality-control here...

You can be sure of quality when you specify Unaflo Oil-Well Cement. Expert technicians regularly make many tests of Unaflo throughout its manufacture and also in our research laboratories over a wide range of simulated well-bottom pressures and temperatures. Such tests are just one phase of a continuous program of Unaflo quality-control and research to maintain and improve its performance.

means you can rely on Unaflo* at the BOTTOM



Oilmen know Unaflo's quality pays off in reliable field performance. In emergencies, they're *sure* of vital extra time because of Unaflo's retarded set. Unaflo stays fluid and pumpable despite heat and pressure. And after its retarded period, it makes a strong, tight seal, resistant to sulfate waters.

FOR YOUR CONVENIENCE, we have compiled average test results for Unaflo's thickening time and compressive strength. For your copy of this up-to-date, authoritative data, write any Unaflo office. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), 100 Park Ave., New York 17, N. Y.

All tests are made according to the latest API Recommended Practice for testing Oil-Well Cements.

"UNAFLO" is the registered trade mark of the retarded oil-well cement manufactured by Universal Atlas Cement Company

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Universal Atlas Cement Company

OIL-FIELD CEMENTS

Unaflo *Retarded* Oil-Well Cement
Resistant to Sulfate Waters

Atlas Portland Cement—Type I

Atlas Portland Cement—Type II
Resistant to Sulfate Waters

Atlas High-Early Cement—Type III

OG-U-136R

UNITED STATES STEEL HOUR—Televised alternate weeks—See your newspaper for time and station

EXPLORATION

Westward Ho—Canadian Style

by Frank J. Gardner

OIL finding in Alberta has taken an exciting new turn to the west. The reef search that was set off by the Leduc and Redwater discoveries was concentrated in the eastern plains area, and in the ensuing 7 years, scant attention was paid to the western foothills belt trending northwest from Turner Valley.

Then came Peace River, Sturgeon Lake . . . and Pembina. The Pembina strike opened a window to the west, and the oil prospects that it revealed were enough to fire the imagination of exploration men all over the continent. The vast Cardium sheet sand, the presence of western reefs, and the more elusive promise of overthrust traps along the eastern edge of the Canadian Rockies have all influenced the swing to the west. Leasing, deep drilling, and shooting are at a feverish pitch along the western edge of Alberta, and the first results are beginning to be felt. If these first strikes are any indication of things to come, the present Canadian reserves picture must be eyed as ultraconservative.

New fields are coming . . . The shaded portion of the map displays a 40-50-million-acre hunting ground 500 miles long and 100 miles wide. It's a near-virgin area, offering favorable sediments to 12,000 ft. plus. Of the hundred or so wildcats now drilling in Alberta, approximately half are concentrated here in the deep-drilling country.

On the map, all the recent discoveries in Alberta are tagged. A glance is all that is needed to see what is happening. A straight-line trend from Clear Hills in the north to Pincher Creek in the south has produced some of the best discoveries of recent years. Boxed tags denote Cardium strikes, unboxed tags those from other and deeper formations. Each of the discoveries is impressive in itself, but when viewed as a whole, the impact becomes electric. One important fact stands out—the discovery of new reservoirs in formations not previously anticipated as oil producers here: the granite wash, deep D-3 reefs, Triassic dolomites, and of course the Cardium. New Mississippian discoveries are even more outstanding.

From the granite wash . . . Clear Hills, northernmost Alberta field, was opened for 600 bbl. per day last month. It is reported to have flowed at rates of 1,268 bbl. daily on ¼-in. choke, from a 40-ft. granite-wash section. This is a new flush oil source for that region and lies below the Upper Devonian at a depth of 6,900 ft.

Another granite wash discovery now is reported at Giroux Lake. This one, 150 miles south of Clear Hills, had oil at 10,000 ft. and opens up wide new vistas for the granite-wash pay.

The Mississippian . . . Probably the most significant discovery since Turner Valley has occurred near southern end of the trend at Westward Ho and at Sundre. In January, Hudson's Bay Oil & Gas Co. No. 1 Sundre scored 2,808 bbl. per day on ¾-in. choke from Mississippian pay at 9,130-78 ft. In February, the same operators completed 1 Westward Ho for 1,002 bbl. per day on ¼-in. choke, from 59 ft. of Mississippian between 8,755 and 8,830 ft. This was about 260 ft. high to the Sundre strike. Operators now wonder if the wells might be on a common uplift 7 miles long. This may or may not be, but already several intervening wells are on the way down to find out.

Other Mississippian strikes have been made by a 52-million-cubic-foot well at Sarcee, 70 miles south of Sundre, and by a 50-million-cubic-foot well at Savanna Creek, another 50 miles farther south.

The Triassic . . . Moving up in the geologic section, another formation that is attracting new discoveries is the Triassic dolomite. Already established as a prolific gas source in the Peace River-Fort St. John region, the formation yielded its first commercial oil well in late 1954 for 240 bbl. per day at Boundary Lake. This discovery lies across the border in British Columbia and was the first commercial oiler for that province. Now, 100 miles south, at Buffalo Lake, Triassic oil has flowed again from a depth of 6,100 ft.

The deep D-3 . . . Another significant development, not yet commercial, was the discovery of D-3 reef 1,000 ft. thick at Sundance, near the center of the trend. Although the test found water at this point, the presence of D-3 reefs at 11,000-ft. depths here, and at 11,316 ft. in the Sundre discovery well, is a sign of flush future oil fields.

And the Cardium . . . As for the Cretaceous Cardium sand, it has begun to pop up everywhere as shown by the boxed names on the map. Pembina, of course, was the first to produce from it. Signs of new Cardium pools now appear at Chinook Ridge, far to the west, in a well described as "the wildest wildcat in Alberta."

The westward movement of exploration in Alberta is reflected in this map of recent discoveries. Boxed names are Cardium strikes; other names are discoveries from other formations.

FEBRUARY'S SUCCESS STORY

Hugoton Embayment Province

1. Rank Ellenburger production established in Texas Panhandle.
2. Excellent Beaver County success led entire area's exploratory race.
3. Permian gas indicated at remote Beaver wildcat.

Mid-Continent Province

4. First Bartlesville sand production established west of Nemaha granite ridge.
5. Commercial Arbuckle dolomite production hinted at Murray County, Oklahoma, wildcat.
6. Important North Madill pool in Marshall County, Oklahoma, extended southeast.

Rocky Mountain Province

7. Eastern Montana recorded year's first discovery.
8. Paradox basin added second oil producer.
9. Northernmost Denver-Julesburg basin discovery completed.

Gulf Coast Province

10. Another deep discovery made in Texas offshore waters.

Western Canada Province

11. Canada's biggest strike of the new year rated 600 bbl. per day on initial potential.

Pacific Northwest Province

12. Idaho showed signs of becoming a producing state . . . the country's thirty-first. Wildcat activity accelerated along Oregon-Idaho border in the Vale-Ontario basin.

February—Month of Surprises

by John C. McCaslin

FEBRUARY outdid itself with exploratory "show stealers." Map-shuffling discoveries caused reappraisals of parts of six geologic provinces, stretching from far-off Peace River to Mustang Island in the Gulf of Mexico.

The fabled Ellenburger . . . It seems that Texans would tire of wildcat surprises, but a deep test in the Texas Panhandle surprised and startled Panhandle operators. The Ellenburger, an infinite source of success, produced its first oil in this vast area.

Phillips Petroleum Co. 1-A Troy, Section 86, Block M-2, BS&F Survey, Gray County, is one of the most important wells to be completed in the Southwest in recent years. The discovery potentialed for 299 bbl. of 44°-gravity oil daily. The strike gave the Panhandle a complete producing section from Cambro-Ordovician through the Permian. Nearest big Ellenburger production is 240 miles to the southwest in Andrews County. Closest Arbuckle (the Oklahoma-Kansas Ellenburger equivalent) is 136 miles northeast in Woods County, Oklahoma. The Ellenburger hit is likely to herald a new era of deep prospecting in the deeper portions of the Anadarko basin of the Texas Panhandle. Two follow-up tests are being closely watched.

Permian pay moves east . . . An assured Pennsylvanian gas discovery in Beaver County, Oklahoma Panhandle, has also hinted Permian production. If Permian gas is proved at Lion Oil Co.'s 1 Hodges, it would move Permian gas about 30 miles east of Hugoton-Permian field.

The Beaver bonanza . . . Following earlier predictions, the Oklahoma Panhandle's Beaver County has taken a front seat in exploratory success in the Hugoton embayment. The Mississippian-Morrow trend in the northeast quarter of the county is growing at a phenomenal rate, both in distance and success. Multipay discoveries, extensions, and development wells radiate from the Mocane area.

Old-timer makes good . . . One of the oldest producing sands in Oklahoma, the Bartlesville-Pennsylvanian, added laurels to its prolific history. West of the Nemaha granite ridge in northern Oklahoma, Vierson & Cochran moved Bartlesville production to its westernmost point in Oklahoma at 1 Burghardt in Southeast Eureka pool, Grant County.

New Arbuckle Interest

Frankfort Oil Co. has indicated commercial Arbuckle oil production at a highly significant wildcat on the north side of the Arbuckle Mountains near

Total February Completions, Exploration and Development

	Total completions					Total wildcat wells					Active operations
	Total	Oil	Gas	Dry	Footage	Total	Oil	Gas	Dry	Footage	
Alabama	7	0	0	7	28,287	7	0	0	7	28,287	7
Arkansas	50	25	0	25	162,001	19	4	0	15	65,510	50
California	176	141	3	32	927,570	28	3	0	25	160,815	223
Colorado	84	22	4	58	452,544	43	4	1	38	231,697	93
Florida	3	0	0	3	16,714	3	0	0	3	16,714	3
Illinois	272	139	1	132	649,578	39	1	0	38	79,953	396
Indiana	59	15	2	42	93,640	30	1	0	29	41,009	63
Kansas	400	220	29	151	1,447,795	76	17	3	56	309,208	448
Kentucky	99	43	10	46	169,780	26	3	1	22	52,343	128
Louisiana	318	215	24	79	1,915,059	46	13	1	32	431,510	419
North	173	130	9	34	478,302	19	1	0	18	105,054	143
South	145	85	15	45	1,436,757	27	12	1	14	326,456	276
Michigan	41	12	0	29	125,332	18	0	0	18	56,874	110
Mississippi	39	18	0	21	313,918	16	1	0	15	117,133	51
Montana	28	9	0	19	144,214	10	1	0	9	69,195	58
Nebraska	37	11	0	26	198,807	23	2	0	21	114,755	58
New Mexico	87	49	30	8	400,093	8	4	0	4	61,395	141
Northwest	29	1	26	2	91,472	2	1	0	1	6,742	22
Southeast	58	48	4	6	308,621	6	3	0	3	54,653	119
New York	20	10	0	10	32,000	0	0	0	0	0	13
North Dakota	13	10	0	3	97,459	1	0	0	1	4,600	29
Ohio	77	37	15	25	164,716	0	0	0	0	0	187
Oklahoma	648	409	17	222	2,347,195	60	15	2	43	262,270	1,048
Pennsylvania	63	21	16	26	164,903	5	0	2	3	28,443	83
South Dakota	1	0	0	1	2,742	1	0	0	1	2,742	3
Texas	1,424	886	42	496	6,344,896	383	67	7	309	1,954,444	1,335
North Central (7-B & 9)	479	270	2	207	1,494,479	151	32	0	119	533,955	320
West (7-C & 8)	358	290	2	66	2,023,823	56	10	0	46	340,598	478
Panhandle (10)	82	62	13	7	266,264	2	0	0	2	17,844	55
East (5 & 6)	78	42	8	28	401,723	23	4	0	19	132,061	77
Gulf Coast (2 & 3)	187	95	10	82	1,186,961	68	11	3	54	526,305	172
Southwest (1 & 4)	240	127	7	106	971,646	83	10	4	69	403,681	233
Utah	3	1	1	1	18,343	2	0	1	1	17,128	21
West Virginia	51	8	32	11	144,624	3	0	0	3	16,140	139
Wyoming	68	39	1	28	314,201	14	2	0	12	74,342	119
Miscellaneous	¶3	0	0	3	14,999	3	0	0	3	14,999	§4
Total February 1955	4,071	†2,340	227	*1,504	16,691,410	864	‡138	18	708	4,211,506	5,229
Total January 1955	4,344	2,486	261	1,597	17,577,717	927	132	33	762	4,460,514	5,310
Cumulative 1955	8,415	4,826	488	3,101	34,269,127	1,791	270	51	1,470	8,672,020	
Cumulative 1954	8,564	4,765	616	3,183	35,782,955	1,747	247	51	1,449	8,666,271	
Western Canada	191	141	7	43	839,246	47	11	4	32	216,617	
Alberta	106	80	6	20	549,421	23	6	3	14	116,260	
Saskatchewan	58	42	1	15	214,719	18	3	1	14	74,995	
Manitoba	22	18	0	4	51,984	1	1	0	0	2,240	
B.C.-N.W.T.	5	1	0	4	23,122	5	1	0	4	23,122	
Cumulative 1955	405	293	28	92	1,784,846	106	27	12	67	516,153	

*Incl. 70 service wells: Calif. 1, Ill. 2, N. Y. 10, Pa. 22, Ohio 4, Okla. 30, Tex. (Dist. 4) 1. †Incl. 43 condensate wells: Calif. 1, N. La. 1, S. La. 11, Miss. 1, Okla. 15, Tex. Gulf Coast 4, S.W. Tex. 10. ‡Incl. 12 dist. discoveries: S. La. 4, Okla. 3, Texas Gulf Coast 4, S. W. Texas 1. §Incl. Nev. 3, Ore. 1. ¶Incl. Nev. 2, Idaho 1. Nev. footage 12,224 ft.

Davis in Murray County, southern Oklahoma.

The 1 Hale, situated near the regional zone of faulting that trends northwest-southeast, failed to find oil in the upper zones and went on into the Arbuckle. At about 2,000 ft. down in that formation oil was recovered, 5,580 ft. of it on a drill-stem test. More than 100 ft. of effective pay has been penetrated. The adjacent zone of faulting is the controlling factor in structural development over a wide area in this section of the state. The outcome of this well is a topic of current wildcat talk in Oklahoma.

No. 2 for the Paradox . . . Shell Oil Co's second discovery in the Paradox basin of southeastern Utah flowed oil at the rate of 913 bbl. per day. The 1 North Boundary Butte in San Juan County got its oil from the Paradox formation (Pennsylvanian). This new strike in an area of great promise is 5 miles southwest of the recent Desert Creek discovery which opened first commercial oil production in the basin.

Year's first in Montana . . . The Montana portion of the Williston basin put on record its first 1955 discovery at The California Co.'s East Bredette wildcat in Roosevelt County.

The 1 Grimm, in an area of no previous drilling, recovered about 20 bbl. of oil per hour on test of the "C" zone of the Mississippian-Charles. This strike is 18 miles northwest of big East Poplar field, and is the first success in eastern Montana since opening of Monoco Oil Co.'s stratigraphic-trap pool at Fertile Prairie in Fallon County late last year.

No. 3 for Texas Offshore . . . Gulf Oil Corp. gave the Texas tidelands its third producing area, 9½ miles southeast of Port Aransas, east of Mustang Island. The discovery well tested 140 bbl. of oil per day on choke. The well, drilled in 48 ft. of water, is on State Lease 41338 in Block 889 off Nueces County. It is about 4 miles from production on Mustang Island. Gulf has applied for drilling permits for two more tests in the area on Block 742 and 717.

Big one in Alberta . . . Alberta's best discovery of the new year had a rated initial potential of 600 bbl. of oil per day. The strike is Canadian Gulf Oil Co.'s Clear Hills wildcat in northwestern Alberta, 45 miles northwest of Peace River town and 67 miles east of the British Columbia border. Production is from granite wash, the first such pay in Canada. An offset is drilling.

Gas in Northwest? . . . New interest was brought to the potentialities of the Pacific Northwest with reports of com-

Total Depth Classifications, February 1955

	A 0-1,250 ft.	B 1,250-2,500 ft.	C 2,500-3,750 ft.	D 3,750-5,000 ft.	E 5,000-7,500 ft.	F 7,500-10,000 ft.	G 10,000-12,500 ft.	H 12,500-15,000 ft.	I Over 15,000 ft.
Alabama	2	1	0	1	3	0	0	0	0
Arkansas	5	11	24	6	3	1	0	0	0
California	7	17	26	50	40	20	13	3	0
Colorado	0	0	1	17	66	0	0	0	0
Florida	0	0	0	1	2	0	0	0	0
Illinois	36	90	146	0	0	0	0	0	0
Indiana	21	29	9	0	0	0	0	0	0
Kansas	1	34	189	164	12	0	0	0	0
Kentucky	40	37	21	1	0	0	0	0	0
Louisiana	11	119	19	11	31	50	44	31	2
North	9	117	15	5	19	5	3	0	0
South	2	2	4	6	12	45	41	31	2
Michigan	6	12	7	11	5	0	0	0	0
Mississippi	0	1	0	1	21	5	10	1	0
Montana	0	5	3	7	7	5	0	1	0
Nebraska	1	1	3	4	28	0	0	0	0
New Mexico	1	20	25	12	13	7	7	2	0
Northwest	0	18	2	2	7	0	0	0	0
Southeast	1	2	23	10	6	7	7	2	0
New York	0	20	0	0	0	0	0	0	0
North Dakota	0	0	2	1	0	10	0	0	0
Ohio	23	18	33	2	1	0	0	0	0
Oklahoma	49	202	178	74	94	33	15	3	0
Pennsylvania	3	43	3	2	10	2	0	0	0
South Dakota	0	0	1	0	0	0	0	0	0
Texas	103	295	295	226	302	148	38	15	2
North Central	60	179	79	81	72	6	2	0	0
West	2	44	70	65	99	47	18	13	0
Panhandle	0	1	74	5	1	0	1	0	0
East	10	2	3	21	32	10	0	0	0
Gulf Coast	6	8	21	30	50	57	12	1	2
Southwest	25	61	48	24	48	28	5	1	0
Utah	1	0	0	0	1	1	0	0	0
West Virginia	0	25	13	12	1	0	0	0	0
Wyoming	8	0	10	9	11	21	6	3	0
Miscellaneous	0	0	1	1	1	0	0	0	0
Total February 1955	318	980	1,009	613	652	303	133	59	4
Total January 1955	357	992	1,172	635	680	327	130	45	6
Cumulative 1955	675	1,972	2,181	1,248	1,332	630	265	104	10
Western Canada	4	25	41	46	65	9	1	0	0
Alberta	2	2	10	23	60	8	1	0	0
Saskatchewan	1	8	23	21	5	0	0	0	0
Manitoba	0	15	7	0	0	0	0	0	0
B.C.-N.W.T.	1	0	1	2	0	1	0	0	0
Cumulative 1955	5	68	89	78	137	24	4	0	0

mercial gas prospects in the Vale-Ontario basin, a small depression that straddles the Idaho-Oregon border. Oroco Oil & Gas Co. reported a shallow gas flow at a Payette County, Idaho test, and a blowout at a well across the line in Malheur County, Oregon.

This northwestern exploratory interest began late last year when plans were approved for the Pacific Northwest pipeline that will run through this Vale-Ontario basin area. El Paso Natural Gas Co. kicked off the current drilling campaign with a 7,500-ft. test on the Oregon side. It was recently labeled a dry hole.

EXPLORATION HIGHLIGHTS

MID-CONTINENT

OKLAHOMA

Deep Test Slated for New North Marietta Area

Derrick is going up for a deep 10,000-ft. Arbuckle test in SW NE NW 34-6s-2e, Love County. It will be drilled by Frankfort Oil Co. The test, 1 Gardner, is an offset attempt for the recently-opened Viola reservoir in NW NW NW 34-6s-2e. This Frankfort discovery is taking production tests.

Lone Grove . . . Oil and gas has been recovered from a workover well in the new prolific Viola lime trend south of Lone Grove in Carter County.

The well, Frankfort 1 Fowler, NW SE NW 17-5s-1w, ran core barrel at 5,087-5,137 ft. Recovery was lime with porosity, stain, and odor. Frankfort has a prolific Viola reservoir in 12-5s-2w, where flows up to 50 bbl. hourly were established from about 500 ft. of Viola lime found below 5,000 ft., generally.

Sunray testing Viola . . . Sunray Oil Corp. is taking flow tests of treat Viola lime at 1-B Fitzgerald, NW SE NE 12-3s-1w, Carter County.

This wildcat flowed for 3 hours on ¼-in. choke at a daily rate of 79 bbl. fluid which was 65 per cent light green oil through perforations at 10,700-800 ft. Later tests flowed 11½ bbl. of oil in 12 hours with some water on ½-in. choke. Gas-oil ratio was 4,800:1.

Commercial Zone Found at North Madill Field Well

More commercial zone is indicated at Sinclair Oil & Gas Co.'s 1 Nunley, SE NW NW 15-5s-5e, North Madill field, Marshall County.

The operator found the third Bromide sand at 6,230 ft. and took a drill-stem test at 6,232-64 ft. Recovery was 105 ft. of oil and 120 ft. heavily oil-

COOPER "420"

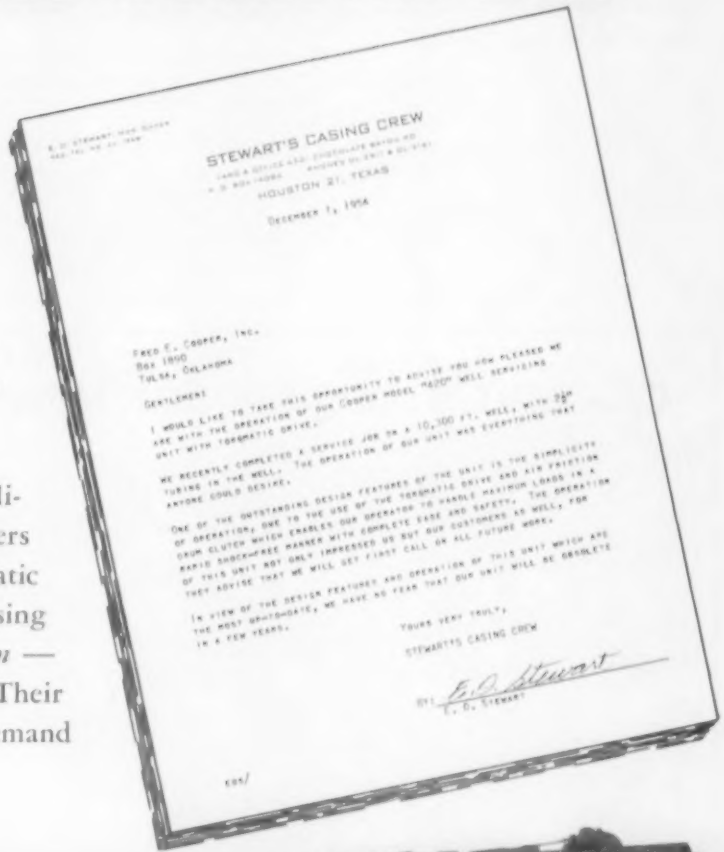
SERVICING and WORKOVER RIGS

WHAT DO THE OPERATORS SAY?

Read what Mr. E. O. Stewart thinks of the COOPER "420".

Stewart's casing crew, a highly successful contracting organization operating in the Houston area, has been in the business many years. They know their business and they know machinery.

This is only one of many complimentary reports received from owners and operators of Cooper Torqmatic Units. Every one of them stressing *Easy, simple shock-free operation — Speed, safety and modern design.* Their customers request and sometimes demand Cooper Torqmatic Drive Rigs.



STEWART'S CASING CREW

HOUSTON 27, TEXAS

December 7, 1956

Fred E. Cooper, Inc.
Box 1890
Tulsa, Oklahoma

Gentlemen:

I would like to take this opportunity to advise you how pleased we are with the operation of our Cooper Model "420" well servicing unit with Torqmatic drive.

We recently completed a service job on a 10,300 ft. well, with 2⅞" tubing in the well. The operation of our unit was everything that anyone could desire.

One of the outstanding design features of the unit is the simplicity of operation, due to the use of the Torqmatic drive and air friction drum clutch which enables our operator to handle maximum loads in a rapid shockfree manner with complete ease and safety. The operation of this unit not only impressed us but our customers as well, for they advise that we will get first call on all future work.

In view of the design features and operation of this unit which are the most obtainable, we have no fear that our unit will be obsolete in a few years.

Yours very truly,

Stewarts Casing Crew

By: E. O. Stewart
E. O. Stewart

eos/

Why not let a Cooper Sales Engineer give you full details, or better yet see one in operation and then talk to the "man that owns one".

Owners of modern, Torqmatic Drive Rigs get "first call" for those deep wells that require the best of equipment.

FRED E. Cooper, Inc.

P. O. BOX 1890 TULSA, OKLA.

Houston, Odessa, Los Angeles, Olney

cut mud. Gas-distillate production was shown on a drill-stem test of the second phase of the Bromide sand.

East Maysville Pool Is Extended to the South

An indicated ½-mile south extension to East Maysville pool in Garvin County is reported at Superior Oil Co. 1 Johnson, C SW NE 23-4n-2w.

Recovery on a drill-stem test in the first Bromide sand at 5,972-6,032 ft. was 2,310 ft. of oil. Sinclair 1 Rogers flowed 304 bbl. of oil in 16½ hours on 17/64-in. choke natural from 6,446-6,514 ft. in the Bromide, also extending the field. That well is in C SE NW 15-4n-2w.

Geophysical Work in Ardmore Area on Upswing

Ardmore is fast becoming a center of geophysical operations in southern Oklahoma. This seismic boom in the area is due to increase.

Atlantic Refining Co. is reportedly set up in the area. Superior Oil Co. has crew headquarters in the city now, and Gulf, Shell, Pure and others are working the area along the northwest-southeast trend from Healdton to Marietta.

In Murray County, near Davis, Okla., Inland Oil Co. has opened crew headquarters, according to reports. Frankfort Oil Co. has entered and dug down into a fault zone at their important wildcat, the 1 Hale, near Davis in SW NE 4-1s-1e. The operator went into black shale and conglomerate at about 7,220 ft. and is in the Dornick Hills at 7,488 ft. The firm has an indicated Arbuckle reservoir of great importance at this wildcat. Up to 5,500 ft. of clean 42°-gravity oil were recovered on drill-stem tests at 6,730-6,930 ft.

Continental Oil Co. will drill a deep wildcat on a seismic prospect in Alfalfa County at 1 Hill, SE SW SW 23-29n-11w. It will go to the Arbuckle lime.

Maysville Townsite Well Completed in Bromide Sand

A first Bromide sand well on the northeast extension side of Maysville Townsite pool in Garvin County has been completed at 1 Rogers by Sinclair Oil & Gas Co.

The well, in C SE NW 15-4n-2w, flowed 304 bbl. of 41°-gravity oil in 16½ hours on 17/64-in. choke from perforations at 6,446-6,514 ft.

North Madill Offset Well Tests Second Bromide Sand

Production from the second Bromide sand has been proved at Sinclair Oil & Gas Co.'s 1 Nunley, SE NW NW 15-5s-5e, east offset to the discovery well of the important Marshall County field.

The well got 2,830 of gas and recovered 35 ft. of distillate on test at 6,130-60 ft. in the second Bromide sand which was topped at 6,118 ft.

KANSAS

Pennsylvanian Sand Strike Is Promising in Kiowa County

Cable tools are being moved in at 1 Piester, APP SW SW NW 24-29s-16w, promising Pennsylvanian sand discovery

CANADIAN OIL APPOINTMENT

WALLACE M. LUTHY

Canadian Oil Companies, Limited announce the appointment of Wallace M. Luthy as Manager of Production, a newly-created position.

The company is entering the oil production field in western Canada and Mr. Luthy will head up and organize a production department with headquarters at Calgary.

Mr. Luthy has been associated with crude oil production and supply for the past 20 years, and was previously Manager of Crude Oil Supply of the Ashland Oil & Refining Co., Ashland, Kentucky.

Advertisement

in Kiowa County, by Gramehart-Miller.

The well recovered 660 ft. of gassy oil and 180 ft. of gas and oil-cut mud on a drill-stem test in the Pennsylvanian sand at 4,578-91 ft. The well is 3½ miles southeast of Pyle pool production.

New Producer Reported at Graham County Wildcat

Graham County has a new producing area at Imperial Drilling Co. 1 Brown, SE SE NW 4-9s-23w, 3 miles south of Millbrook field.

The well swabbed at the rate of 40 bbl. of oil per hour for 4 hours from perforations in the Lansing lime at 3,768-72 ft.

Brooks Hall and Benson-Montin 1 Huntington, SE SE SW 7-7s-25w, another wildcat discovery in Graham County, flow-tested 32 bbl. of oil in 3 hours from the Lansing. The perforations were at 3,848-54 ft. This well is 7 miles northwest of Schmied field production.

Arbuckle Pays Off at New Barton County Well

Thunderbird Drilling Co. 1 Kimpler, SE NE SE 31-18s-11w, is a new Arbuckle lime producer for Barton County.

The discovery well is swabbing oil at the rate of 10 bbl. per hour from perforations at 3,411-14 ft.

WEST TEXAS-NEW MEXICO

WEST TEXAS

Outpost Staked to Gaines County Devonian Prospect

Gaines County's two Devonian discoveries, one in the north and one in the south, cored and tested additional pay section, and a long offset was staked for another Devonian try.

New location is for Burdel Oil Co. et al, Snyder, 2 Riley estate, ½ mile east to Humble Oil & Refining Co. 1-B Riley. Drill site is on a 160-acre lease in Section 259, Block G, WTRR Survey.

Meanwhile, Humble's test was coring ahead following its fifth successful drill-stem test in the Devonian. The section at 11,601-33 ft. developed 11,330 ft. of oil in 2 hours.

Anderson-Prichard Oil Corp., Husky Oil Co., and U. S. Smelting Mining & Refining Co. 1 Webb, near the northern county line, was coring ahead below 13,095 ft. At that depth, and based on drill-stem tests, the well had a pay section in the Devonian of approximately 150 ft.

Corrected reports on drill-stem test at 13,024-41 ft. gaged the well at 48.87 bbl. of oil an hour. Previous estimates on that test were up to 60 bbl. an hour. Top of the Devonian was 13,024 ft.

GULF COAST

SOUTHWEST TEXAS

Jim Hogg Gets New Field

Paul J. Moore's new oil-discovery well 12 miles southwest of Hebbronville, in northwestern Jim Hogg County, is rated good for 65 bbl. of 33°-gravity oil per day, flowing through ⅝-in. choke. Pressure on potential test gaged 30 psi. on the tubing and 390 psi. on the casing. The well, 1 Gutierrez, in Survey 164, produces from Loma Novia sand, perforated at 3,207½-16½ ft.

San Patricio County Discovery Flows Oil

An oil flow of 149 bbl. per day is reported at a wildcat 3 miles west of Aransas Pass in San Patricio County.

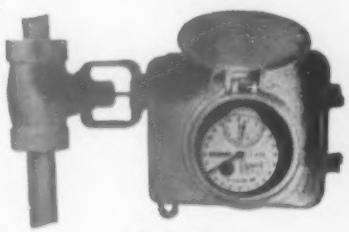
The well is Conroe Drilling Co., Heep Oil Corp., and Renwar Oil Corp. 1 Ola McCann, W. Smith Survey, A-243. The discovery flowed 149 bbl.

The time you save today is the money you make tomorrow.

Enardo has designed two time cycle switches for your convenience; the model "A" and the model "MB" both are dependable hand wound clock movements, set in cases that are vapor proof, dust proof, and moisture tight; the difference being that the model "A" is a mercoid tube switch and the model "MB" employs an underwriter's laboratory approved micro-switch. They are both designed to shut down your engine at a pre-determined time. Both come in 12 and 24 hour time cycles and have "run-times" of 11 hours on the 12 hour model and 22 hours on the 24 hour model.

Enardo has developed another time and money saver called the model "W" clock shut-off valve. It is designed to control the flow of pressures up to 100 PSI of gas or liquid, and to shut off the supply at a pre-determined time. It is particularly adaptable for use on fuel lines to engines. The model "W" clock is manually set and has the same "run-time" as the above models.

You will find that these clocks will eliminate a large percentage of return trips. Write Enardo for bulletins 10-01, 10-03, 10-05.



MODEL "W"

MODEL "A"

ENARDO manufacturing company
BOX 1647 • TULSA, OKLAHOMA

from perforations at 7,794-97 ft. A ⅛-in. choke was used. Gas-oil ratio is 718:1.

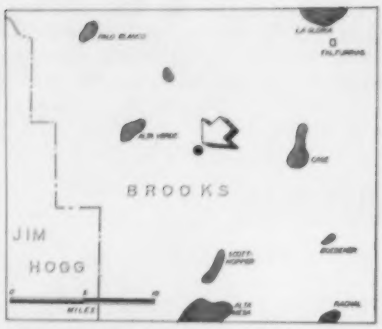
Brooks County Wildcat Completed as Producer

Bridwell Oil Co. has a new oil-discovery well in Brooks County. The well, 1 Casey, in the James T. Mauphin Survey, 14 miles southwest of Falfurrias, flowed on potential gage at the rate of 123.44 bbl. of 40.5°-gravity oil per day through ¼-in. choke.

Flowing pressure was 775 psi. on the casing and 150 psi. on the tubing. Gas-oil ratio was 160 cu. ft. per barrel.

Production is from casing-perforated sand interval at 5,667-75 ft. Hole was drilled to 6,215 ft.

"Bob Cooper" is the tentative name of the new area.



Bridwell Oil Co.'s new oil-discovery well (shown by arrow) in Brooks County.

Milam County Wildcat Will Make Deeper Hole

A wildcat in Milam County, 3½ miles west of Milano, originally scheduled for 9,000 ft., will go on to 10,000 ft. The operator, Texas Gulf Producing Co., is digging now at 8,814 ft.

The well, 1 Fee, is located on the Jose Leal Survey, A-29, Tract 74.

TEXAS GULF COAST

New Oil Field Opened In Southern Jackson

Southern Jackson County has a new oil field at R. E. Hibbert 2 Hensley, 7 miles east-northeast of Point Comfort.

The discovery well flowed 198 bbl. of oil daily on ⅛-in. tubing choke from perforations at 8,734-40 ft. It was completed as the discovery well of Hensley (8,700-ft. sand) field. Gravity of the oil is 47°. Gas-oil ratio is 906:1. Location of the field-opener is Josiah Bell Survey.

New pay at Hull Townsite . . . A new gas pay is indicated for Liberty County's Hull Townsite pool.

The well, I. L. McMahan 1 Gott, Lot 7 of Block 10 of the Chestnutt Subdivision on the N. Daigle Survey, A-180, flowed gas and some distillate on drill-stem test at 8,934-44 ft. Operator is now making production tests. This new well, with indicated DY sand production, appears to be on a separate fault block from the Merchant and Northeast Merchant areas. It has indicated separate fault block production.

SOUTH LOUISIANA

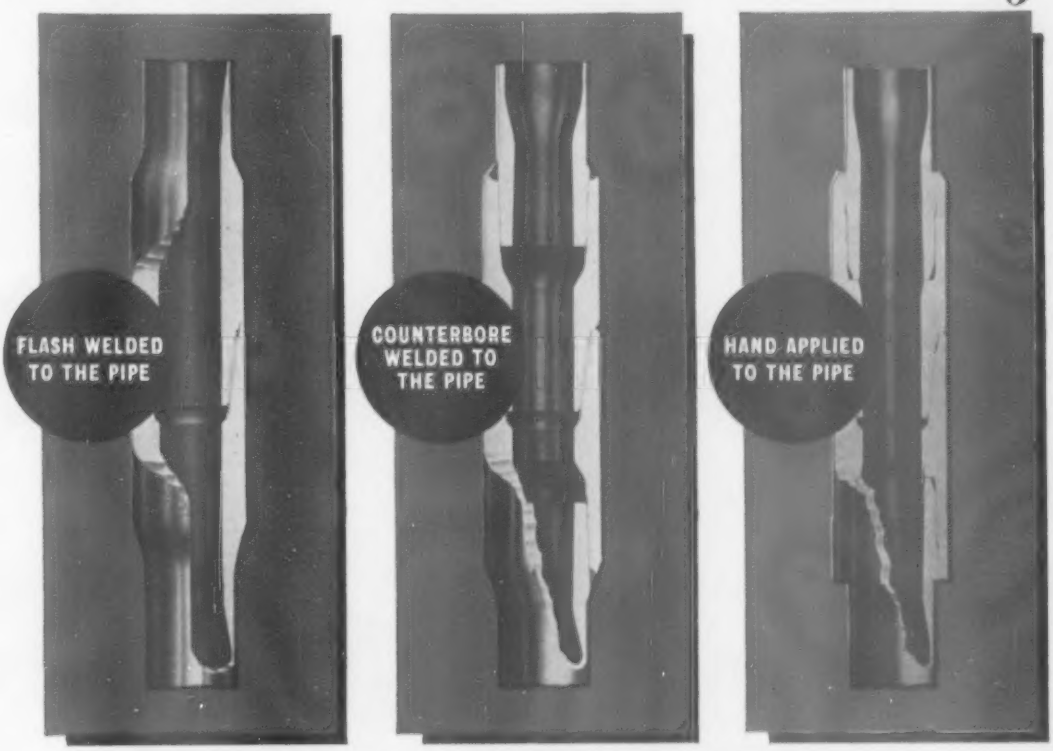
Shell Confirms Production In South Pass Block 6 Area

Shell Oil Co. has confirmed production at Plaquemines Parish's new South Pass Block 6 area, off the southeast tip of the Mississippi River Delta.

The confirmation well, 2 State Lease 2590, also opened a new gas-distillate pay. The well, drilled to 8,701 ft., completed from 8,336 to 8,340 ft. The well flowed 168 bbl. of 42°-gravity distillate

It's the TOOL JOINTS *that count... when you buy a new drilling string!*

and REED TOOL JOINTS *last longer!*



When you order a new string, you are looking for two things:

The best tool joints your money can buy . . . and a pipe connection that will give you the service and economy that your needs dictate. Above all, you want *good tool joints.*

Our one hundred and twenty continuous tool joint inspections throughout the manufacturing process assure you the safest tool joints that money can buy. Continuous, automatically controlled heat treating gives a uniformity that no other method can equal.

When you buy your next string, specify REED Tool Joints. We can furnish any type pipe connection you desire.

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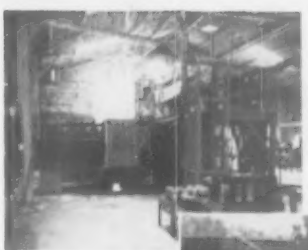


REED TOOL JOINTS FLASH WELDED TO DRILL PIPE ON MODERN MACHINES BY SKILLED OPERATORS.

REED SUPER SHRINK-GRIP TOOL JOINTS APPLIED BY HAND — ANYWHERE.

REED TOOL JOINTS COUNTERBORE WELDED TO THE DRILL PIPE BY THE 45° ANGLE, 3 BEAD PROCESS.

REED ROLLER BIT COMPANY

HOUSTON 1, TEXAS

Gulf Coast, Mid-Continent, Rocky Mountain and Canadian Distributor for Martin-Decker Products

plus 2,660 M.c.f. of gas per day under 2,850 psi. Gas-distillate ratio was 15,907:1.

The discovery well of the offshore strike was Shell 1 State Lease 2,590. It was completed in January for 288 bbl. of oil per day and 182 M.c.f. of gas per day on 10/64-in. choke from perforations at 8,337-49 ft. The new field has good prospects. It is located 4 miles northeast of Southeast Pass field.

Camerina Sand Well Gaged At Lake Arthur Outpost

A Camerina sand gas-distillate producer has been completed on the southeast flank of Jefferson Davis Parish's big Lake Arthur field.

The new producer, Union Sulphur & Oil Corp. 1 Louis Krielow et al, flowed 107.4 bbl. of 41°-gravity distillate plus 4,368 M.c.f. of gas per day on 10/64-in. choke from perforations at 12,600-50 ft. The well is located in the SWc 30-10s-3w.

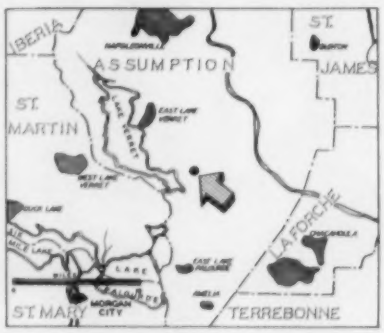
Continental Gets Second Well In Acadia's Rayne Field

The second oil well in Rayne field, Acadia Parish, has been completed at Continental Oil Co. 2 Mouton, 47-9s-2e, on the north side of the field's producing area.

The field has seven gas-distillate producers and is very active. The 2 Mouton was completed flowing 503 bbl. of 40.5°-gravity oil and 562 M.c.f. of gas per day from perforations at 11,982-96 ft. in the Homeseekers "C" sand.

The discovery well of the field, the 1 Pettitjean and Co., was completed in late 1953 for 618 bbl. of oil, 43.6° gravity plus 479 M.c.f. of gas from 11,905-20 ft.

Assumption Parish Has Gas-Distillate Discovery



A new gas-distillate field has been opened in Assumption Parish's Kittridge area, about 6 miles southeast of East Lake Verret field.

The pool opener, Hassie Hunt, Trust, 1 Kittridge, is located in 79-14s-14e. The discovery flowed at the rate of about 100 bbl. of 58.2°-gravity distillate plus 3,000 M.c.f. of gas per day through perforations at 9,822-26 ft. on 10/64-in. choke. Gas-liquid ratio is 30,000:1. The well is between two Phillips Petroleum Co. dry holes. It is 13 miles northeast of Morgan City and 15 miles northwest of Thibodaux.

Lafourche Parish Strike Potentialed at Little Temple

Commercial production has been established at Little Temple in Lafourche Parish by Humble Oil & Refining Co. The new producer is the 1 Alton Jones, 30-17s-23e, about 2½ miles south of Delata Farms field.

It flowed 194 bbl. of 35.2-°gravity oil per day on ⅛-in. choke from perforations at 10,669-79 ft. It previously flowed gas-distillate from 10,760-70 ft. at the rate of 12 bbl. plus 1,681 M.c.f. of gas with excessive water. Humble has begun work at the confirmation well, 2 Afton Jones, in 25-17s-22e. This well is contracted to 11,600 ft.

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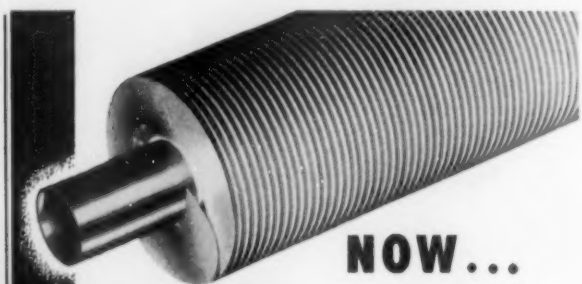

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APPALACHIAN

PENNSYLVANIA

In Unity Township, Westmoreland County, Southwest Pennsylvania, Peoples Natural Gas Co., has announced location of 2-4037 Fred Musnug, wildcat, elevation 2,087 ft., Donegal Quadrangle, 1.34 miles south of latitude 40 degrees 15 minutes and 1.35 miles west of longitude 79 degrees 20 minutes.

● Parker Township, Butler County, Walker et al 1 John Walker, is drilling again after drilling by the tools in a fishing job at 7,275 ft., and are now at 7,305 ft.

WEST VIRGINIA

Area's Deepest Well Finaled at 13,331 Ft.

In Walker district, Wood County, West Virginia, the deepest well ever to have been drilled in the Appalachian fields, resulted in a dry hole. It is Hope Natural Gas Co. 9634 Power Oil Co., rank wildcat, elevation 1,039 ft., Oriskany sand 4,307-4,528 ft., Clinton sand 7,680-7,810 ft., Trenton lime 9,516-10,494 ft., Beekmantown 10,494-10,606 ft., TD 13,331 ft.

● Licking district, Tucker County, this company announced 9940 Darl Watson, wildcat, location 1,809 ft., Belington Quadrangle, 1.39 miles south of latitude 39 degrees 15 minutes and 1.30 miles west of longtitude 79 degrees 45 minutes.

OHIO

Patton Drilling Co. extended their Layland pool ¼ mile to the south with a gasser on 1C (3) E. E. Meyers, Lot 27, Clark Township, Cochocton County. Clinton sand at 3,288-3,303 ft. had a show of oil and sand at 3,314-29 ft. gaged 1,300,000 cu. ft. natural.

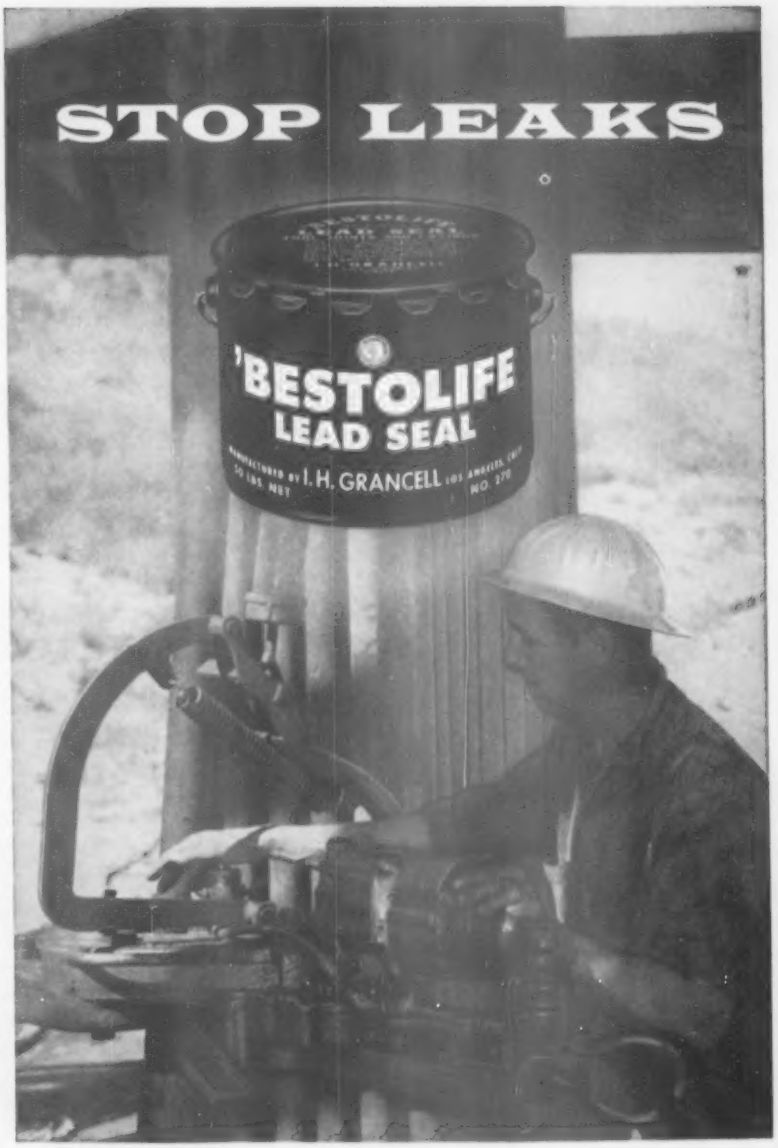
● The Greer pool in Jefferson Township, Knox County, was extended to the west by the Hipp Lumber 3 Ralph Hipp, Section 1. Clinton at 2,765-91 ft. and 2,805-18 ft. had an oil showing natural and 230 bbl. in 24 hours after fracturing.

• Scott Oil Co. drilled in a 1,440-bbl. well on the Carl Fisher farm in Licking County, Ohio, in Section 10. Reached pay sand at 3,280 ft. got pay at 20 ft. in the sand with about 35 bbl. natural. After fracturing it made the above.

It's the best well ever drilled in this area.

EASTERN KENTUCKY

In Magoffin County and located on Short Fork, Buffalo Oil Co. has completed 1 Jim Frazier as a Mississippian



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Weir sandstone producer. At a depth of 1,145 ft. test initialed for 5 bbl. daily.

• On Wolf Creek in Martin County, E. C. Ware 5 Roscoe Preece has been completed for 15 bbl. of oil daily from Maxon (Mississippian) sand at a total depth of 1,543 ft.

WESTERN CANADA

ALBERTA

Formation Water Entered At Giroux Lake Discovery

The Giroux Lake area wildcat reported last week as a granite wash oil discovery for northwestern Alberta has now entered formation water.

Indications are that this well has about 17 to 20 ft. of oil pay zone above that water. The well, drilled by Stanolind, is 60 miles southwest of High Prairie and 80 miles southeast of Grande Prairie.

Production Casing Set at Texaco's Pembina Wildcat

Texaco Exploration and McColl Frontenac Oil Co., Ltd., have set production casing through the Cardium sand at their wildcat in the Pembina region.

This well, Texaco-McColl A12-20 Braemar, LSD 12, 20-50-10w5, lies 6½ miles northwest of Stanolind-Hudson's Bay C-1 Crown Cardium sand oil discovery and about 6 miles north-northwest of the team's first indicated oil discovery well, the Texaco A-2-27 Aurora well.

Another well in the same area, being drilled by Stanolind and Hudson's Bay, also set string of production casing. This well, A-1 Blue Rapids, LSD 16, 1-47-10w5, is 5 miles southeast of the 1 Pembina oil discovery well and about that distance south of the main part of Pembina field.

PACIFIC COAST

CALIFORNIA

Polvadero Outpost Tests Shallow Pay

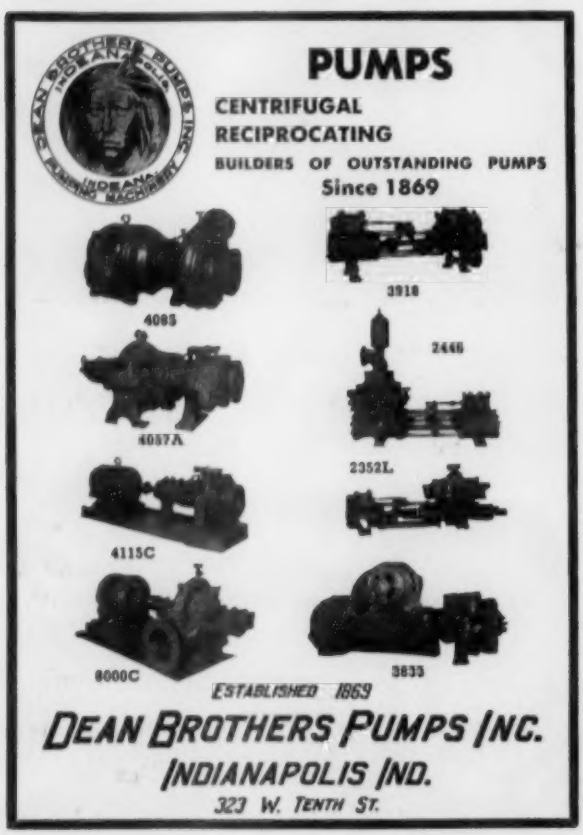
Standard Oil Co. of California 564 1-H, a northeast offset to Los Nietos Co.'s recent Gatchell sand (Eocene) discovery at Polvadero, indicated a shallower pay will be productive.

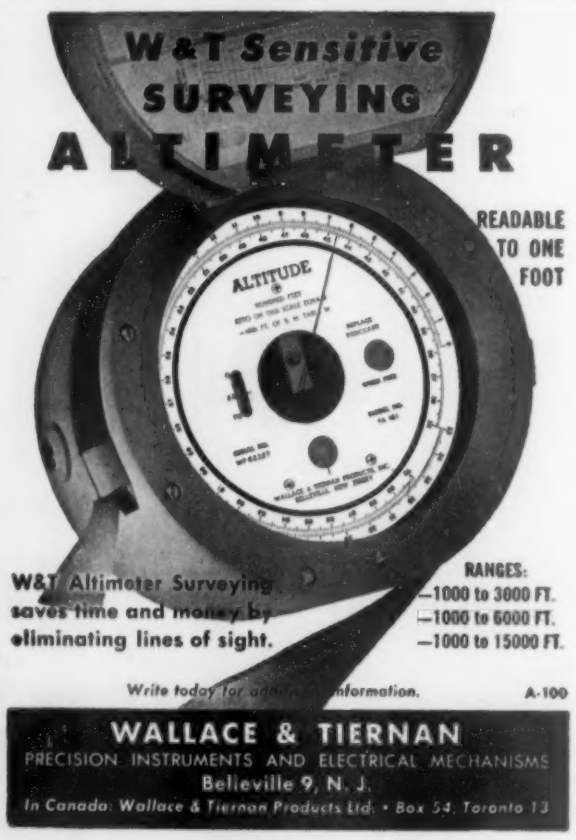
The Fresno County well, in SW NE 1-21s-16e, flowed at a 1,000-bbl. per day rate on a 30-minute test at 8,411-35 ft. This Sanger sand equivalent was found in the discovery but was not tested. The well continued toward the 10,000-ft. Gatchell sand following the test.

Arrow points to Fresno County's recent Gatchell sand discovery area. A shallow pay, the Sanger sand, has been tested at Standard Oil Co. 564-1-H.

New Montalvo Outposts

Two new outposts were preparing to get under way southeast of the 12,000-ft. oil pool Sunray Oil Corp. 1 Ohio-Bailard-McGrath discovered near the

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West Montalvo field in Ventura County. Sunray 1 Ohio-Kraemer-De Cielo in SE NE 31-2n-22w, will be a southeast offset to the discovery. E. L. Doheny, operator, 1 Richfield-Laubacher, a 14,000-ft. test, was scheduled for NW NW 5-1n-22w.

Standard Stakes New Fillmore Outpost

Standard Oil Co. of California was clearing site for a 15,000-ft. wildcat 2½ miles northeast of its deep three-well Fillmore field in Ventura County. The company already was under way with a 1-mile west extension attempt to the 14,000-ft. pool. In addition two field wells were under way.

The new test will be 1 Sespe Creek Community in NE NW 24-4n-20w. Its 2 Hardison Ranch-2, the western extensioner, was drilling below 8,000 ft. This test is about 1 mile northeast of 1 Hardison, suspended last December at 15,630 ft.

Sunset Beach Field Given Set-Back

The Sunset Beach area on the northwest flank of Huntington Beach production, Orange County, received another set-back when a ½-mile eastern outpost was suspended. The test, Ben D. Owens 1 Flamingo in NW NW 28-5s-11w, suspended activity after drilling to 6,950 ft.

In SE SW Section 20, Atlantic Oil Co. 6 Ramser, a west offset to a 500-bbl. producer, was redrilling near 6,000 ft. after the first 6,650-ft. hole missed the pay. Atlantic suspended operations at 1 Sunset in NE NW 29 after drilling to 8,535 ft. without success.

Wheeler Ridge Outpost Testing

Richfield Oil Corp. 2 San Emidio-B was preparing to test a 11,630-70 ft. interval after redrilling from 8,500 ft. to 11,844 ft. In the original hole, which was bottomed at 11,938 ft., potential Eocene sand production was found at about 11,225 ft. The new hole was redrilled in an effort to find the pay at a better structural position. The wildcat is located 1½ miles southwest of Richfield's Wheeler Ridge Eocene production, in NE SW 31-11n-20w.

OREGON

Test Attempt at Malheur County Wildcat Fails

Oroco Oil & Gas Co. and J. R. Simplot failed in attempts to test gas shows at 1 Bolles, NE NW 15-17s-47e,

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Malheur County. According to the operators, the well was drilled to a total depth of 2,000 ft., with pipe landed at 1,150 ft. The zone 1,082-84½ was perforated and on attempts to test the tool and casing were filled with sand. The formation is reported as loose and unconsolidated. The well is now shut down and the operators will clean out for a second test attempt.

A previous wildcat, 1 Carpenter, SE NE 4-8n-5w, 2 miles south in Payette County, Idaho is preparing to test. It was suspended after some gas shows. Attempts to test and complete were delayed until a second well was drilled, since nearest supply centers are nearly 800 miles away.

ROCKY MOUNTAIN

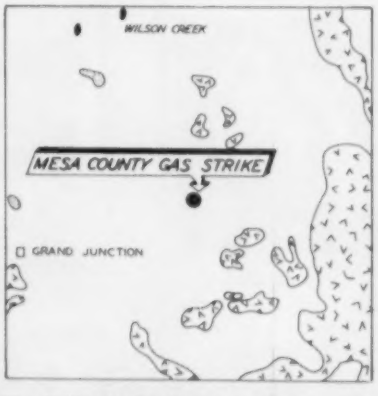
COLORADO

Confirmation Location Made In Shell Creek Area

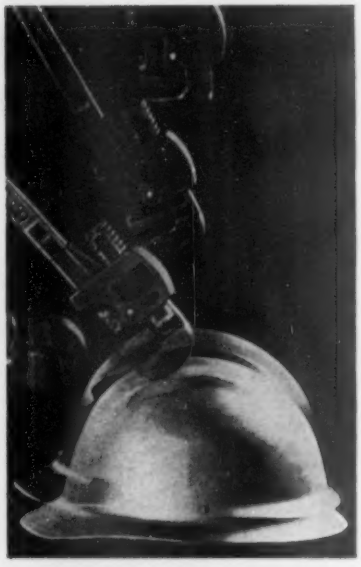
Mountain Fuel Supply Co. has made location for a confirmation well in the Shell Creek area, Moffat County. The new well is 2 Government-Cooley, SE SE NW 11-11n-100w. It will test Mesaverde at about 9,300 ft. The discovery in this area has not been officially completed, and is now drilling below 7,948 ft. It is 1 Government, C SW SW 1-11n-100w. Gas at the rate of 5,920,000 cu. ft. per day was recovered on test 5,305-88 ft. Test was above Mesaverde, with formation not reported.

Mesa County Wildcat Is Apparent Gas Discovery

The California Co. recovered gas at the rate of 7,000 M.c.f. per day on test of a deep wildcat in the Divide area of Mesa County. The well is 1



The California Co. has an apparent gas discovery at a deep wildcat in Mesa County's Divide area. It is the 1 Hurd-Government, NW SE NE 36-8s-91w.



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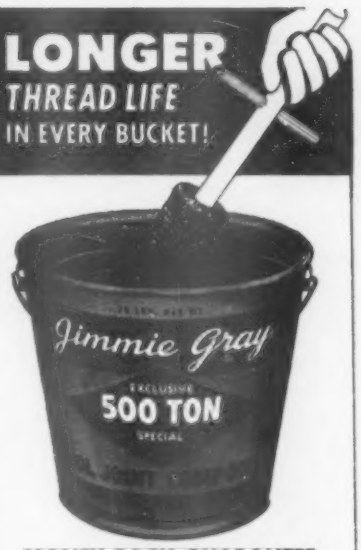

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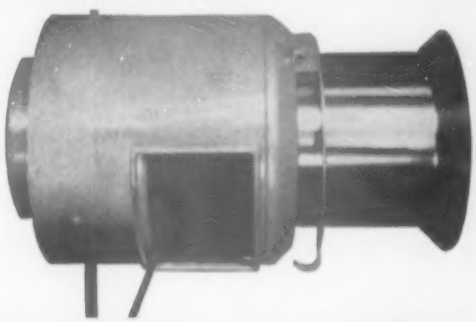

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Hurd-Government, NW SE NE 36-8s-91w. Test was at 10,943-11,020 ft. The tool was open for 18 minutes, with flowing pressure of 2,880 psi. at the end of the test.

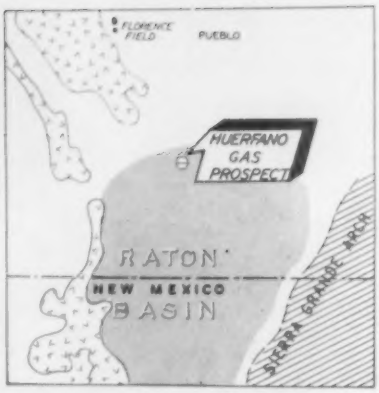
The tested zone is reported as a fractured shale above Dakota. The operator was last reported preparing to run a new drill-stem test with the well at total depth of 11,141 ft.

The wildcat is 22 miles southeast of Rifle, in an area which has had a previous deep test with no shows reported. The present well is scheduled to test Tensleep (Pennsylvanian) at 12,000 ft.

Four Discoveries Tested in Denver-Julesburg Basin

Four wildcats in the Denver-Julesburg basin portion of Colorado are apparent discoveries, with final tests near on all of them. Successful tests were run on wildcats in Logan, Weld and Morgan counties.

In Weld County, Houser Drilling recovered oil at the rate of 30 to 40 bbl. per hour at 1 Turner, NW SW SE 1-7n-59w. Test was of perforations at 6,484-95 ft., and the well flowed for ½ hour before perforations plugged.



A Huerfano County rank wildcat, Lee Drilling & Exploration Co. 1 Capps, found gas in the Dakota sand at 440 ft. The test, 9 miles southeast of Walsenburg, continued drilling at 490 ft. A second well has been staked in 26-28s-65w.

Top of "D" sand was called at 6,487 ft. The operator has acidized and will Sandfrac the formation before tests are resumed. The well is bottomed at 6,682 ft. with pipe landed at 6,600. Location is 4 miles west of the town of New Raymer.

In Morgan County, Petroleum, Inc. tested "D" sand at 1 Peterson, NW NW NE 20-2n-56w. The operator reported a flow of oil after 45 minutes of the 1-hour test 5,171-74 ft. There was no estimate of the rate of flow. Pipe recovery was 3,670 ft. of oil and flowing pressure was 1,300 psi. at the end of the test. The operator was last reported drilling below 5,287 ft., after pulling "J" sand cores without shows. The well is 1 mile northwest of production in Gary field.

Skelly Oil Co. reported recovery of 370 ft. of oil and 180 ft. of water in a 1-hour test of 9 Roediger, SW SE NE 29-1n-56w. This test was at 5,132-42 ft., in "D" sand. The well is 1 mile west of Gary field. Skelly landed pipe at 5,189 ft. and was last reported waiting on pipe.

Colorado Geologists Plan May Field Trip

The Rocky Mountain Association of Geologists, Denver, will hold its annual 1-day spring field conference on May 20, 1955.

The trip will cover the pre-Cambrian to Tertiary section along a 32-mile section of the Front Range of the Rockies west of Denver. It will originate at Perry Park, 20 miles south of Denver, continue northward to the Ralston Dike, 12 miles northeast of Denver.

Emphasis will be placed on fault structures, sedimentation of Dakota and Lyons sandstones, and oil seepages.

The area to be covered is of particular interest at the present time. Oil

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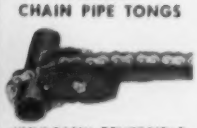

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was discovered in late 1954 under the well known Golden thrust fault. The discovery well was drilled in the Morrison area southwest of Denver. Additional exploration further north is now in progress.

The trip will be largely under the guidance of F. M. Van Tuyl and L. W. LeRoy. Reservations may be made with Floyd H. Miller, British-American Oil Producing Co., eighth floor, Denver Club Building, Denver, Colo. His telephone number is AComa 2-9401.

East Woodrow Field New Pay Discovery Completed

Petroleum, Inc., has completed 1 Sharp, S½ SE SE 26-1s-55w, in the East Woodrow area, Washington County. The well flowed 3,680,000 cu. ft. of gas per day on small choke from "J" sand perforations at 4,822-28 ft. The well was a scheduled extension to East Woodrow, where oil is produced from "D" sand. There is no previous gas production closer than at Little Beaver field, 10 miles west and south.

First Field Conference for Four Corners Geologists

The Four Corners Geological Society will sponsor its First Field Conference on June 15-17, 1955. All male members, students, and interested parties are invited. Registration headquarters will be the Strater Hotel in Durango. Registrations must be in by June 14.

The trip begins in Durango and will end there on the 17. This conference will make it possible for participants to see salient geologic features in portions of the San Juan and Paradox basins, and along the north rim of the Black basin of Arizona. This entire area is rapidly gaining in geologic importance and it is hoped that the trip will acquaint those attending with the varied structural geology and lithology of the Four Corners region, an area possessing widespread mineralization, uranium, and future oil provinces.

For information and application forms, contact Housing and Registration Committee Four Corners Geological Society Field Trip, Box 1469, Durango, Colo.

WYOMING

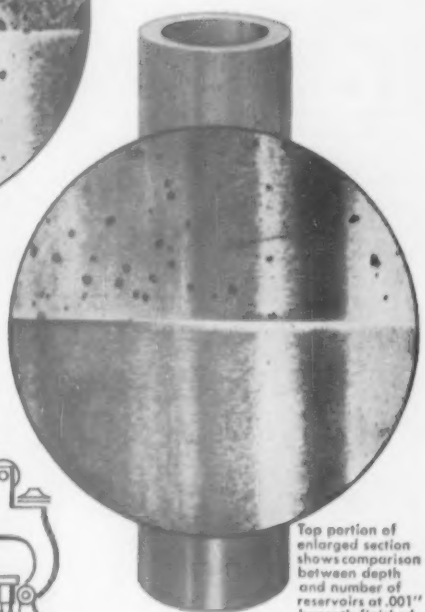
Goshen County Wildcat Staked

True & Brown and R. H. Fulton Co. have made location for 1 Smith, C NE SW 28-24n-61w, Goshen County. The well is the second announced in the county since completion of the first discovery in Goshen County a few weeks ago. The discovery was drilled

The New Pacific

PACILITE (TRADE MARK) PLUNGERS FOR DEEP OIL WELL PUMPING...

The number of surface reservoirs on top portion of enlarged section is characteristic of Pacilite treated chrome plungers. Bottom portion shows same surface .001" beneath finished surface.



Top portion of enlarged section shows comparison between depth and number of reservoirs at .001" beneath finished surface and .005" where controlled etching has eliminated reservoirs.

HAVE MILLIONS OF MICROSCOPIC PORES that actually soak up lubricants!

Pacific Pacilite process is a method of control etching a multitude of minute surface reservoirs to provide maximum retention of lubricants after the chrome plated plunger is ground to desired size. Result is much longer plunger life and virtual elimination of sticking and galling. Pacilite treatment also relieves high tensil plating stress and reduces possibility of cracking or shearing under heavy shock loads. For complete details write for Technical Bulletin No. 201.

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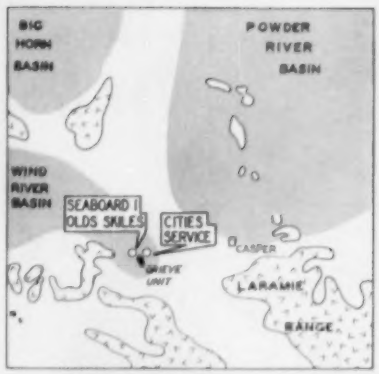
by F. R. Anderson and Great Basin Petroleum, Inc., in the Torrington area. The new location is 2 miles north of the discovery.

Albany County New Pay Discovery Completed

The California Co. reported a pump gage of 191 bbl. of fluid, 40 per cent water at 3 Seven Mile Unit, SE SW 9-17n-77w, Albany County. Production is from Lakota at 6,324-50 ft. Previous production at Seven Mile is from Muddy.

Locations Staked In Grieve Area

Locations for two wildcats in the southeastern Wind River basin in the vicinity of the Grieve unit have been announced by two operators. Cities Service Oil Co. will drill 1 Government-C, C NW SW 12-32n-85w. It is 2½ miles northwest of the Grieve Unit discovery, and will test Morrison at 10,000 ft. The second wildcat will be drilled by Seaboard Oil Corp. It is 1 Olds-Skiles, SW NE SW 7-32n-85w, 1½ miles northeast of Grieve Unit production. The area has had new attention since the 1954 discovery on this unit by Forest Oil Co. The discovery well was 1 Morton 22-1 Unit, NE SE NW 22-32n-85w. It was completed for 1,220 bbl. of oil per day flowing through small choke. Production is from the Muddy zone of Thermopolis shale. Seaboard has not named a specific objective formation for the new wildcat.



Two wildcats have been staked in Natrona County's Grieve Unit area. One will test the Morrison at 10,000 ft. The tests are near the big discovery well at Forest Oil Corp. 1 Morton 22-1 Unit, comp'eted for 1,220 bbl. of oil daily. The tests are: Cities Service 1 Government-C, C NW SW 12-32n-85w, and Seaboard 1 Olds-Skiles, SW NE SW 7-32n-85w.

MONTANA

Stanolind Extends Pine Production to Southwest

In Pine field, Wibaux County, Stanolind Oil & Gas Co. 2 State of Montana "B," flowed 257 bbl. of oil in 24 hours on 20/64-in. choke, extending production one location to the southwest.

Production was from the Stoney Mountain (Ordovician) sand, topped at 8,763 ft. Total depth of the well is 9,014 ft. and gravity of the oil is 34°. Location is C SW NE 16-11n-57e.

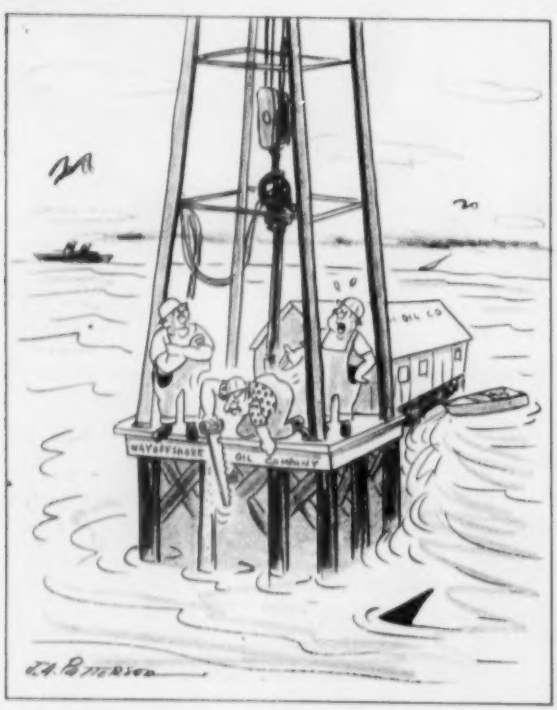
Madison Test Located In Treasure County

F. H. Brady and L. M. Wampler, independents, have made location for a Madison test in the Vananda area of Treasure County. The well is 1 Smith estate, NW SW 34-7n-37e. There is no production closer than that Sumatra, 36 miles to the northwest.

Fallon County Wildcat Announced

Rothschild Oil Co. of Santa Fe Springs, California has made location for an Ordovician test on the east flank of the Cedar Creek anticline in Fallon

THE OIL AND GAS JOURNAL



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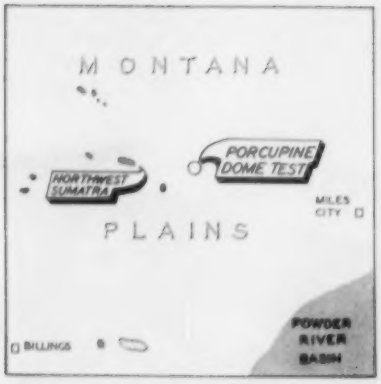

Richfield Oil Corp. is moving in to drill a wildcat at 1 Cherry Creek Sheep Co., SE NE 32-11n-36e, in the Porcupine Dome area of Rosebud County. The wildcat will test the Heath at about 5,000 ft. The wildcat, first in the area, is on the west flank of the dome and 20 miles east of Northwest Sumatra field on the Montana Plains.

County. The well is 44-15 Northwest Improvement Co., C SE SE 15-9n-59e. Objective is expected at about 9,100 ft. The eastern flank of the anticline has had few tests but is considered by many operators to be one of the more promising areas in the Montana portion of the Williston basin.

The new location is 7 miles southeast of Cabin Creek, and 14 miles north of Fertile Prairie. Both these fields have production from Ordovician.

NORTH DAKOTA

Hunt to Drill Stark County Wildcat

Hunt Oil Co. has located for 1 Privratsky, NW NW 15-138n-98w, Stark County. The wildcat is to test Madison. It is 7 miles east of a 1954 failure by Sun Oil Co., which was abandoned after extensive tests which recovered noncommercial amounts of free oil from Madison.

East Offset to Sanish Discovery Flows Oil

Stanolind Oil & Gas Co. 1 Dora Hopkins, east offset to the discovery well in Sanish field, flowed 183 bbl. of 41.6°-gravity oil in 24 hours. Choke used was 20/64-in.

Production is from the Sanish (Miss.) sand, which was topped at 10,647 ft. Plugged back total depth of the well is 10,700 ft. Testing continues.

The 1 Hopkins is ½ mile east of the 1 Woodrow Starr, the field discovery well. Both are on the Fort Berthold Indian Reservation in McKenzie County, where Stanolind holds leases on 17,000 acres. Location of the well is SW SW 22-152n-94w.

NEBRASKA

Oil Recovered at Kimball County Wildcat

E. K. Carey Drilling Co. recovered 418 ft. of oil and 20 ft. of fresh water on test of the "D" sand interval 5,772-75 ft. at 1 Schmidt, SE SE SW 12-13n-54w, Kimball County. Tool was open 2 hours. Shut-in pressure was 1,225 psi. after 30 minutes. The operator will test "J" sand, and is reported coring below 5,881 ft. The discovery is 1 mile southwest of nearest production in Voss pool.

UTAH

North Boundary Butte Discovery Near Completion

Shell Oil Co. had landed pipe at 5,475 ft. at 1 North Boundary Butte, C SW NE 33-42s-22e, San Juan County. The operator drilled to a total depth of 5,975 ft. The well became an apparent discovery with recovery of oil at the rate of 913 bbl. per day from 4,731-79 ft. from Paradox. Completion will be in this zone. The well is 5 miles southwest of Desert Creek.

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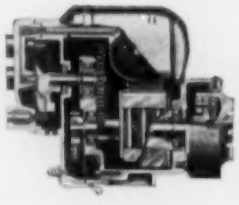

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Successful Wildcats

SOUTHWEST TEXAS

Atascosa County: Texita Oil Co. 1 Eggert, Tract 5, Griffith Ranch Subd. (2½ miles southeast of Charlotte). IPP 37 BOPD (net), 35 per cent water, 38°, Navarro (open hole) 5,423-49 ft. TD 5,449 ft. (New field.)

Caldwell County: Hoxsey Oil Co. 3 Ross, Samuel Shupe ⅓ League. IPP 91 BOPD, 35°, Edwards 2,328-58 ft. (perforations). TD 2,425 ft. (New pay in Luling Branyon field.)

Starr County: Breuer & Robinson Oil Co. 1 Marrs McLean, Porcion 80, Share 20-B (5 miles north of Rio Grande City). IP 10,400 M.c.f. daily, open-flow potential, dry gas, perforations 2,605-08 ft. TD 4,567 ft. (Extends Zim area.)

MKN Cattle Co. 1 Rene Vera et al, Section 33, Porcion 94 (10 miles northwest of Sullivan City). IP 3,200 M.c.f. daily, open-flow potential, dry gas, perforations 2,832-48 ft., and 76,000 M.c.f. daily, open-flow potential, dry gas, perforations 3,217-26 ft. TD 4,781 ft. (Extends Holland area.)

TEXAS GULF COAST

Bee County: Holmes Drilling Co. and Robert Mosbacher 2 Collier, Patrick Carroll Survey, A-12. IP 2,035 M.c.f. daily, 5/32-in., gas-condensate ratio 16,400 cu. ft. per barrel, 55°, perforations 9,218-22 ft. and 9,230-34 ft. TD 10,040 ft. (New field.)

(Continued on page 210)

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Counterbalancing is faster, easier and more accurate. One man, working at ground level, can safely and accurately counterbalance an Emsco unit due to their patented rotary counterweights.

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D+B-Otis installations consist of two positive displacement pumps that operate with an annular style cross-over packer. A pack off unit in the packer body separates the upper and lower zone fluids.

Several types of assemblies are offered to meet various production conditions: Where more production is required from one zone, where production desired is the same, and for wells with unbalanced gas-oil ratios. It is also possible to flow one zone and pump from the other.

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E-190.B-55

Beringer In Dual Job

British American chief is old refinery hand

BRITISH AMERICAN OIL CO. broke a precedent of 49 years standing recently when it appointed affable, oil-wise Milton S. Beringer, 62-year-old board chairman, to serve also as its new president.

Beringer has been British American board chairman since 1951 and this year succeeded Ole Berg, Jr., in the president's chair. The move was the capper to a career in oil which began for Beringer in South Texas and took him far afield in the United States, Europe, and Canada.

A man with the build of a football player—6 ft., 190 lb.—and the appearance of a suave diplomat, Beringer brought an unorthodox approach to his job as board chairman.

He appeared at his offices every day in the executive floor of the British American Oil Building in Toronto, broadening his knowledge of all operations of the company. He was informal and courteous, never passing an employe without a nod or smile of greeting.

Employes recall he is an inveterate mixer at company social events whether at the annual Christmas dance at the Toronto Royal York or the big oyster party at Montreal East Refinery.

He is in his element at gatherings of working refinery personnel. With them he can reminisce about refining operations in the early days when fire and explosion were ever-present hazards—a far cry from today's ultra-safety and efficiency devices.

Beringer started with British American in 1934 when the company bought the Coutts, Alberta, holdings of Northwest Stellarene Co. Beringer was retained as plant superintendent.

He was born in Gonzales, Tex., in 1893, attended Texas A. & M. College where he received a B.S. degree in chemical engineering in 1916, and then served with the U.S. Field Artillery in World War I. He worked with the old Sapulpa Refining Co., Continental Oil Co., the Arthur G. McKee Engineering Co., and supervised refining construction in the Ploesti oil field in Roumania.

After returning to the United States in 1929, Beringer joined the staff of Northwest Stellarene. During the first 10 years with British American, he built the company's Turner Valley Absorption Plant, the Calgary Refinery, and the Clarkson, Ont., refinery in addition to major alterations at the Montreal plant.

Also during this period, he served as manager of refineries at Calgary and Toronto and in 1945 was appointed manager of all British American refineries, moving from that to vice president in charge of manufacturing. He directed in the next 6 years the biggest refinery construction program in the company's history, climaxing the achievement by being appointed board chairman.

The British American chairman-president and his wife live in a comfortable penthouse apartment on Toronto's Eglington Avenue where they have gained a wide circle of friends. In their leisure hours, the Beringers enjoy an evening at the theater, a concert, or witnessing a football, hockey, or golf exhibition. Their son, Milton R., is a civil engineer at the Gulf's Philadelphia refinery.

One of the penalties in Beringer's present preoccupation with British American affairs is his lack of time for goose hunting and fishing. He hopes, however, when his duties take him back to the Calgary refinery it will be the goose-hunting season and he can hunt with a few cronies still there from his days as refinery manager.

Henry C. England, Jr., has been named coordinator of safety for Sun Oil Co.'s production department. England joined Sun in 1939 at Brenham, Tex. Before being named safety and personnel man at Corpus Christi, Tex., in 1947, he was a junior petroleum engineer at Odessa, Tex. **O. Trotter Adams,** safety and personnel man at Odessa, has been transferred to Corpus Christi to succeed England.

Frank Devlin, district geologist with Sunray Oil Corp., has been transferred from Midland, Tex., to Casper, Wyo.

Ernest L. Petree has been named assistant manager of production of the Tulsa production division of Gulf Oil Corp. Petree is being transferred to Tulsa from the Houston production division, where he was serving as division production supervisor. Petree joined Gulf in 1935.

T. C. Bartling, executive vice president of Apache Oil Corp., has been named manager of the firm's recently

T. C. BARTLING

JOHN WONCIK

established Tulsa offices. Bartling had been serving as exploration manager of W. C. McBride, Inc., St. Louis, before joining Apache. **John Woncik** has been named assistant manager of the Tulsa office. Woncik was a subsurface geologist with Warren Petroleum Corp. before going with Apache. Apache provides geological service and land and leasing facilities to independents or companies not having these departments.

Gerald C. Summers, senior research technologist for Magnolia Petroleum Co. at that firm's field-research laboratories in Dallas, last week accepted a United States Letters Patent for Magnolia in Washington. The award was made by **Robert C. Watson,** U. S. Commissioner of Patents, for Summer's work on the development of a new acoustic-velocity logging tool. The Patent Office is making the award in conjunction with its current exhibit in Washington on "Research and Technological Progress Under the American Patent System."

Alfred T. Ireson, exploitation engineer of Shell Oil Co. in the Casper, Wyo., division, has been transferred to division log engineer in Billings, Mont. Other changes announced by Shell include: **Albert K. Dittmer,** mechanical engineer, assigned to the production department, Billings division; **Howard Hurst, Jr.,** named stratigrapher in the exploration department, Denver division; **Leonard J. Schombel,** appointed district geologist, Billings division;

PERSONALS

Marshall E. Welbourn, exploitation engineer, Denver area, transferred to Billings; and **Thomas E. Young,** division geophysicist, Dakota division, transferred to Billings.

W. F. Stroud, vice president and general manager of Atlantic Refining Co., has been elected to the board of directors. Stroud, who joined the company in 1916 in the power department of the Philadelphia refinery, was elected a vice president in 1952.

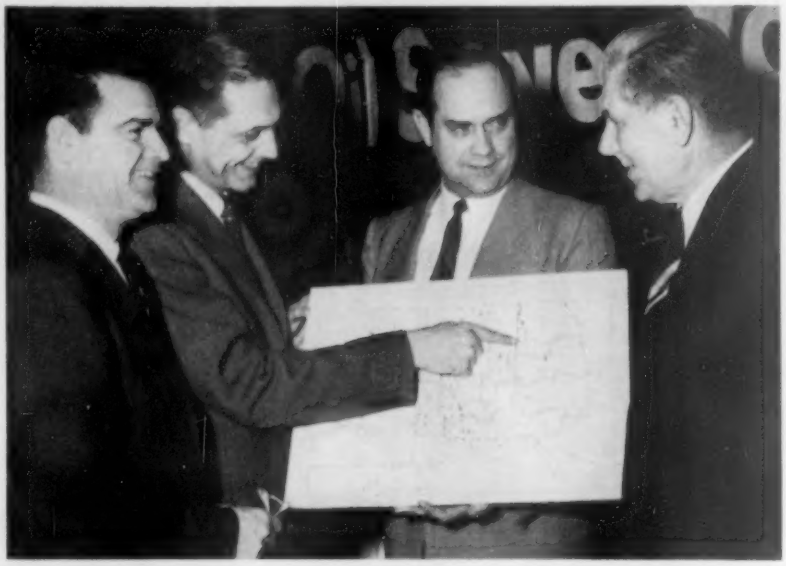
Paul V. Smith, Jr., Esso Research & Engineering Co., has been chosen to receive the President's Award of the American Association of Petroleum Geologists. The award is given annually to the author under 35 years of age whose article in the Association Bulletin is judged the most significant. Smith's winning paper is entitled "Studies on Origin of Petroleum: Occurence of Hydrocarbons in Recent Sediments." It was published in the A.A.P.G. Bulletin in March 1954.

Paul E. Kuhl, assistant general manager of manufacturing of Esso Standard Oil Co., has been named general manager of the Abadan refinery on a 2-year loan assignment to the Iranian Oil Refining Co. Kuhl joined Esso in 1926 and later served as manager of the Aruba refinery. He later served as associate manager of the process division of Esso Research & Engineering Co. He also served 1 year as director of foreign refining for the Petroleum Administration of Defense in Washington.

A. C. Hogge, former chief technologist at the Wood River, Ill., refinery of Shell Oil Co., has been promoted to assistant superintendent. Other changes announced by Shell at Wood River include: **A. J. Wood,** manager of the alkylation department, promoted to chief technologist; **J. R. Noles,** manager of the stores department at the Norco, La., refinery, named to the same position at Wood River; **S. F. Good,** gas department manager at Norco, named manager of the alkylation department. **R. K. MacIntyre,** chief engineer-field at the Wilmington, Calif., refinery named to a similar position at Wood River; **Allen Collins,** assistant chief engineer - field at Wood River, promoted to assistant manager of the personnel department at New York; **W. S. Myers,** manager of the gas department at Wood River, named manager of the dispatching department at Wood River; **J. A. Marshall,** assistant manager of the aromatics department, promoted to department manager of gas; **R. A. Fischer,** technologist in aromatics, named assistant manager of that department; **B. W. Dunbar,** manager of the catalytic cracking department at Wood River, named manager of zone B at the new Anacortes, Wash., refinery; and **P. E. Malson,** former dispatching department manager at Wood River, named manager of zone A at the Anacortes plant.

Arthur J. Helmbrecht has been elected vice president of Buckeye Pipe Line Co. Helmbrecht joined Buckeye in 1935 as assistant to the chief engineer. In 1948, he was promoted to chief engineer and in 1952, he was named assistant to the president.

Howard M. Mays, Oklahoma superintendent for Globe Oil & Refining Co., has been transferred from Pauls Valley to Cushing, Okla.



New Chairman Pushes Oil Information Program

W. R. Huber, right, Gulf Oil Corp., Pittsburgh, new national chairman of the Oil Industry Information Committee, inspects an O.I.I.C. activity map with Melvin J. Rupp, left, Denver, regional O.I.I.C. director, and H. B. Miller, third from left, New York City, executive director of O.I.I.C. Robert A. Douglass, Ethyl Corp., Tulsa, the Kansas-Oklahoma O.I.I.C. district chairman, points to new committee areas in Oklahoma. Huber and Miller currently are visiting district information committees to explain an expanded program for 1955.

G. S. John and **H. M. Brennan** have been named group leaders by Standard Oil Co. (Ind.) in the hydrocarbon research division of its Whiting, Ind., laboratories. **J. E. Wolf** has been named a group leader in the process division of the laboratory.

John S. Black has been elected president of South Saskatchewan Pipe Line Co. Black, formerly with Magnolia Pipe Line Co., will open head offices for the firm in Regina. Other officers are **Fred H. Wilcox,** manager of production for Socony-Vacuum Oil Co., Inc., New York, vice president; **Harry Phipps,** central pipe line division of Socony, Wichita, vice president; **H. R. Moorman,** executive vice president of Socony-Vacuum Oil Co. of Canada, Ltd., vice president; **E. C. Mishou,** general manager of Minnesota Pipe Line Co., St. Paul, vice president; **Paul E. LeFevre,** assistant treasurer, Socony, New York, treasurer; **H. E. McCombs,** Socony of Canada, Calgary, secretary; and **W. E. Cockburn,** Regina, assistant secretary-treasurer. Directors, in addition to Black, Mishou, Phipps, and Moorman, include: **J. P. Parten,** president of Woodley Petroleum Co.; **Maurice E. Sandlin,** president of Woodley Canadian Oil Co. and vice president of Woodley Petroleum; **A. E. Pasche,** Socony, New York; **George Magruder,**

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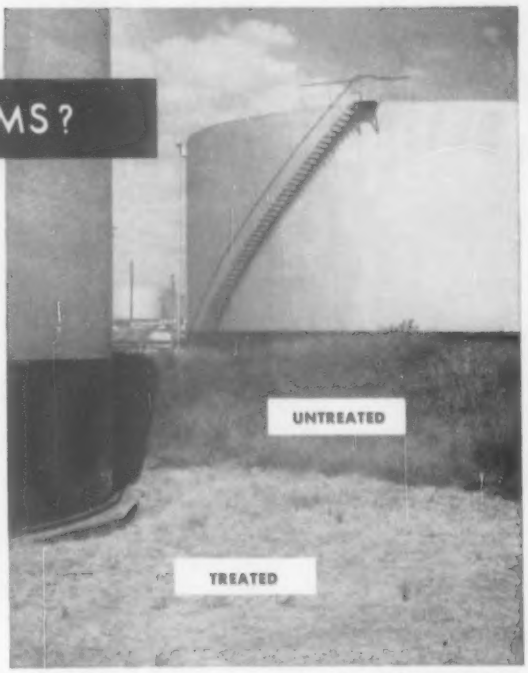

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On all chemicals always follow directions for application. Where warning or caution statements on use of product are given, read them carefully.

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The large single-tube design of the Parkersburg Horizontal Separator gives you advantages in oil-gas separation unmatched by two-tube designs. It assures maximum efficiency because it provides, in a greater degree, all the elements that are essential to optimum separator performance; viz, separating oil and gas; degassing the oil; de-oiling the gas; automatic control of the flow.

All of these advantages are the result of:

1. GREATER GAS FLOW AREA which provides about 20% more area for primary separation... 20% greater area to slow the velocity of the stream.
2. GREATER INTERFACE AREA increases opportunity for liquid to give up maximum amount of gas.
3. LONGER RETENTION TIME in the single-tube Parkersburg Separator provides further opportunity for gas to be released from the oil.
4. NO-BLEED LIQUID LEVEL CONTROLLER operating on hairline precision, and with extreme sensitivity to liquid level changes, assures trouble-free, accurate flow control.

Your Parkersburg Representative will submit detailed information on sizes and capacities of the Parkersburg Horizontal Separators, from which to select the unit to meet your separating conditions.

Parkersburg

RIG AND REEL COMPANY

DIVISION OF PARKERSBURG : AETNA CORPORATION

PESA

3345 WINTHROP AVENUE
FORT WORTH 16, TEXAS

5512

PERSONALS

Southern Production Co., Inc., Fort Worth; and **W. H. Strong,** Southern Production Co., Inc., Calgary.

Paul E. Geiser, former superintendent of Continental Oil Co.'s petrochemical plant at Chicago, has been promoted to market development representative for the company. **K. R. Gerhart,** assistant superintendent of the Chicago plant, has succeeded Geiser as superintendent.

D. R. Bullard, president of Fidelity Oil & Royalty Co. since its founding in 1930, has been named chairman of the board. **W. T. Doherty,** vice president, was advanced to the presidency. Other company promotions include: **Robert Grosjean,** former chief geologist, promoted to vice president in charge of exploration and development; **M. V. Kelly,** named vice president in charge of drilling and production; and **W. A. Streich,** secretary - treasurer, named vice president.

H. Donald Borger has been elected president of Peoples Natural Gas Co., effective April 1. Borger succeeds

H. D. BORGER

J. J. JACOB, JR.

John J. Jacob, Jr., who will retire. Borger also succeeds Jacob as a director of Consolidated Natural Gas Co., Peoples' parent company. Borger began his career with Peoples in 1921. He was named a vice president in 1951. Jacob joined Peoples as a civil engineer in 1922. He was named president of the company in September 1953.

E. C. Taber, Jr., Oklahoma division exploration manager of Shell Oil Co., has been appointed area geologist at Tulsa. **G. H. Thompson, Jr.,** has been named to succeed Taber as division exploration manager at Oklahoma City. Taber joined Shell in 1939. Before his Oklahoma appointment, he was North Texas division exploration manager at Wichita Falls. Thompson began his Shell career in 1941 as an assistant geologist at Centralia, Ill. Before his present appointment as Oklahoma division exploration manager, he had been on special assignment.

John E. Arens, former head of the economics and financial research department of Union Oil Co. of California, has opened offices in Los Angeles as a corporate financial consultant.

John Wolfe, chemical engineer with Gulf Oil Corp., has been transferred from Sweetwater to Port Arthur, Tex.

Henry J. Wedig, geologist with Kingwood Oil Co., has been transferred from Bismarck, N. D., to Oklahoma City.

John E. Woodward, Jr., geologist with Gulf Oil Corp., has been transferred from Winters to Wichita Falls, Tex.

James E. Clark, geologist with Ohio Oil Co. at Lincoln, Nebr., has been promoted and transferred to Grand Rapids, Mich., as district geologist.

James P. Richards, former field engineer with Tide Water Associated Oil Co. at New Hope field, Scroggins, Tex., has been promoted to area engineer with the firm at Cayuga, Tex.

A. B. Brown, general manager of Richmond Exploration Co., has been transferred from Venezuela to Indonesia. He has been assigned to the staff of N. V. Caltex Pacific Petroleum Mij. **Ignacio Bonilla** has succeeded Brown in Venezuela.

Earnest Jack Barnes, geologist with Humble Oil & Refining Co., has been transferred to Genoa from Conroe, Tex.

C. G. Faubion, former seismic party chief with Atlantic Refining Co. at Sweetwater, Tex., has been promoted to district geophysicist at Midland, Tex.

Lawrence E. Hoover, geologist with Pontiac Refining Co. the past 2 years, has resigned to enter geological consulting work. Hoover, a University of Texas graduate, will evaluate properties for uranium possibilities as well as other geological work.

Dr. Eugene Jablonski, former manager of the exploration division of Socony-Vacuum Oil Co., Inc., has been promoted to coordinator of exploration of the producing department. **Verner Jones,** former exploration manager of Socony-Vacuum Oil Co. of Venezuela, has been named to succeed Jablonski. **Spencer Taylor,** former assistant exploration manager for Socony in Venezuela, succeeds Jones.

DEATHS

James Kenneth Murphy, 55, Tulsa independent geologist, died March 22 in a Tulsa hospital after an illness of several years. Murphy served as chief geologist for British-American Producing Co. from 1938 until 1944. He then helped form Norbla Oil Co. and served as secretary-treasurer and geologist of the company until he resigned in 1951. He was president of Miners Oil Co. from 1951 to 1952, when it was dissolved. Since then he served as an independent geologist.

Roy G. Gordon, 58, independent operator in the New Lexington, Ohio, area, died March 19, at his home in New Lexington. Gordon was a former manager at Tulsa of Lee C. Moore, Inc., and from 1942 to 1947 was an independent operator in Tulsa.

Thomas Daniel Hanratty, 86, retired assistant superintendent of Gulf Oil Corp.'s pipeline department, died March 22, at his home in Tulsa. Hanratty had worked in Texas and McAlester, Okla., before moving to Tulsa more than 40 years ago.

Herbert D. Borne, 61, retired assistant secretary and assistant treasurer of Texas Pipe Line Co., died recently at his home in Tulsa after a 5-year illness. Borne worked for Texas and affiliated pipeline firms from 1917 until retiring in 1951. He was secretary-treasurer of Kaw Pipe Line Co. and Texas Empire Pipe Line Co. (now Texaco-Cities Service Pipe Line Co.) when he retired.

David J. Oven, Enid, Okla., drilling contractor, was killed recently near Wichita Falls, Tex., in an automobile wreck. Oven, a son-in-law of the late H. H. Champlin, founder of the Champlin Refining Co., was associated with the company until its sale last year to the Chicago Corp.

Earl A. Richardson, 76, who organized Fargo Oil Co. in 1921 and headed the firm until it was purchased by Carter Oil Co. in 1946, died recently in Denver.

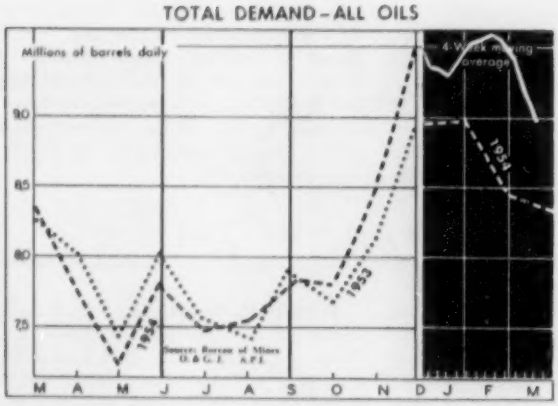
Louis Carl Sauter, 68, retired engineer of Mene Grande Oil Co., died recently at his home in Houston.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,834,700	UP	4,200	UP	338,440
Crude stocks	260,544,000	DOWN	737,000	DOWN	2,630,000
Completions	1,042	UP	123	UP	54
Refinery runs	7,474,000	DOWN	2,000	UP	461,000
Gasoline stocks	183,953,000	UP	529,000	UP	6,333,000
Distillate stocks	63,735,000	DOWN	97,000	UP	1,123,000
Four-product stocks	311,542,000	UP	746,000	UP	9,150,000
Total imports	1,446,200	UP	219,700	UP	234,000

TOTAL DEMAND—ALL OILS



Premium Gasoline May Carry Most of Cost of Making Better Gasolines

MOST refiners are still faced with the problem of recovering capital investment and other costs of making better gasolines.

The gasoline market has been very competitive for more than a year. Higher quality in gasoline has been used as a sales tool by many companies to maintain or expand markets. In some cases octane ratings of gasoline could be raised through use of blending materials no longer needed for making aviation gasoline. Other suppliers have met the competition by adding capacity for cat cracking and cat reforming. Some have added alkylation.

This increased processing has added to the over-all production cost of gasoline at a rate that has been out of proportion to the actual gains in octane numbers. It costs much more to move up the two octane numbers from 92 to 94 than from 84 to 86.

The last round of higher octanes came at a season when gasoline markets are normally slack. The problem was more acute this year because gasoline prices have been soft on most markets since early last summer. Gasoline price wars at the service-station level have been very troublesome on the East Coast for at least a year. Regular gasoline on the Group 3 spot market has been below normal for at least a year and a half. Group 3 regular spot gasoline is moving at the same price that existed before the crude price change in June 1953.

Again, it is the refiners' major problem to find a way to recover some of the increased processing cost under present market conditions.

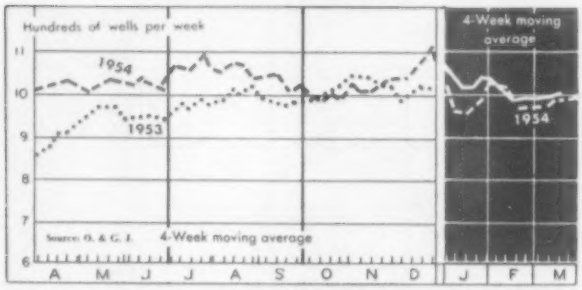
Gasoline marketers have found that there has been less resistance to increases in premium prices than for regular grades. Some sellers upped the spread between premium and regular at the service-station level with very little loss in premium gallonage. In most of the gasoline price wars the competition has been on regular. When cuts were made in premium prices at service stations, the reductions were much less than for regular.

However, this strength of the premium-gasoline market has not been reflected in spot prices at the refinery. Normal spot quotations on the Group 3 market call for a spread of only a cent a gallon between regular and premium. Even this difference has been reduced at times. During the past winter a good part of the premium on the Group 3 spot market moved at only 0.75 cent above the price for regular.

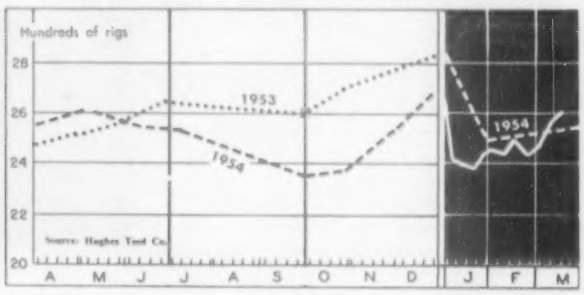
Recent trends in the gasoline market are toward a greater spread between premium and regular gasolines on spot markets. Most suppliers now are getting the full cent over regular for premium on the Group 3 market. Competition in the premium market seems to be slanted toward quality rather than price.

Some refiners are thinking in terms of 0.25 to 0.50 cent increase in the spread between premium and regular. If the gasoline market as a whole strengthens enough for a general price boost, the new spread still would be retained. In line with this trend, quality of regular gasoline probably will not be increased as much as premium.

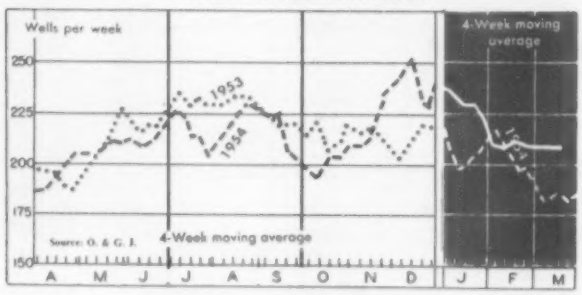
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	3-21-55	Change from 3-14-55	Change from 3-22-54
Gulf Coast	581	6	49
N. and W. Texas-New Mexico	860	3	54
Arkansas-N. Louisiana-E. Texas	177	3	—21
Oklahoma	316	—10	—79
Kansas-S. Nebraska	187	6	24
Illinois-Eastern	127	3	—6
Rocky Mountain	196	4	—34
Pacific Coast	158	13	10
Total United States	2,602	28	—3
Western Canada	196	—12	47

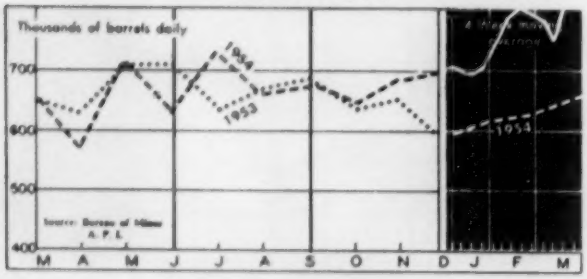
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MARCH 19, 1955

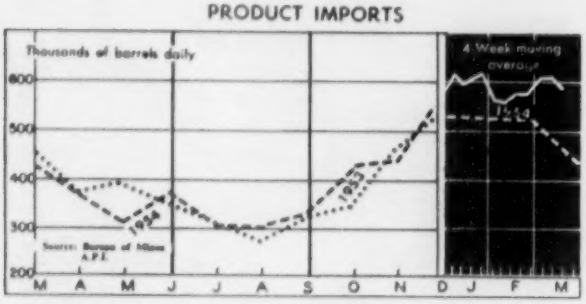
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1955	Cum. 1954	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1955: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	0	0	2	3,472	26	27	0	0	0	2	2	0	0	0	25	25
Arkansas	15	8	0	7	63,583	112	131	0	0	0	3	3	7	0	0	31	38
California	53	42	0	11	236,540	503	528	0	0	0	7	7	7	0	1	78	86
Colorado	29	3	2	24	162,692	268	242	0	0	1	16	17	9	0	6	132	147
Illinois	44	23	0	21	112,400	761	532	0	0	0	4	4	12	0	0	93	105
Indiana	15	5	0	10	24,027	140	172	0	0	0	4	4	3	0	0	52	55
Kansas	97	50	7	40	347,425	1,048	875	3	1	0	18	22	32	1	7	169	209
Kentucky	24	10	7	7	38,617	273	232	0	0	0	2	2	9	0	2	46	57
Louisiana	73	42	10	21	479,113	791	681	0	2	2	7	11	25	14	8	76	123
North	39	27	4	8	111,892	420	326	0	0	0	3	3	3	2	1	33	39
South	34	15	6	13	367,221	371	355	0	2	2	4	8	22	12	7	43	84
Michigan	5	3	0	2	14,781	119	128	0	0	0	1	1	2	0	0	45	47
Mississippi	9	5	0	4	63,446	94	70	0	0	0	4	4	1	0	0	37	38
Montana	14	8	1	5	52,099	83	57	0	0	1	3	4	1	0	1	25	27
Nebraska	19	8	0	11	123,128	123	74	0	0	0	7	7	7	0	0	58	65
New Mexico	48	22	18	8	199,215	262	277	1	0	0	5	6	9	1	0	20	30
Northwest	17	0	17	0	70,785	71	81	0	0	0	0	0	1	0	0	4	5
Southeast	31	22	1	8	128,430	191	196	1	0	0	5	6	8	1	0	16	25
North Dakota	8	7	0	1	52,099	42	47	0	0	0	1	1	0	0	0	6	6
Ohio	20	8	6	*6	39,331	222	229	0	0	0	0	0	0	0	2	5	7
Oklahoma	157	113	3	†41	510,763	1,626	1,917	6	0	0	10	16	31	5	5	124	165
Pennsylvania-New York	22	7	6	‡9	55,453	354	514	0	0	0	0	0	0	0	4	3	7
Texas	368	234	11	123	1,451,135	3,927	3,751	14	1	5	73	93	147	15	28	827	1,019
Southwest (1 and 4)	56	29	3	24	193,596	627	542	1	0	2	16	19	20	6	10	160	196
Gulf Coast (2 and 3)	37	25	2	10	242,326	516	577	2	1	1	6	10	17	9	12	135	173
East (5 and 6)	19	4	2	13	105,368	222	161	0	0	0	9	9	7	0	0	68	75
North Central (7-B and 9)	165	110	1	54	445,847	1,378	1,406	6	0	0	27	33	76	0	0	319	395
West (7-C and 8)	75	51	2	22	415,727	972	884	5	0	2	15	22	29	0	4	141	174
Panhandle (10)	16	15	1	0	48,271	212	181	0	0	0	0	0	0	0	2	4	6
Utah	0	0	0	0	0	11	15	0	0	0	0	0	2	0	2	4	8
West Virginia	11	3	7	1	34,771	135	118	0	0	0	1	1	0	0	2	7	9
Wyoming	9	6	1	2	53,198	180	325	0	0	0	1	1	3	0	2	34	39
Miscellaneous	0	0	0	0	0	7	50	0	0	0	0	0	0	0	0	7	7
Total United States	**1,042**	607	79	356	4,117,288	11,107	10,992	24	4	9	169	**206**	309	36	70	1,904	2,319
Total previous week	919	533	53	333	3,682,107			27	4	6	168	205	285	32	61	1,735	2,113
Total March 20, 1954	988	571	70	347	4,147,332			32	3	8	154	197	305	35	74	1,852	2,266

Service wells included: *2, †4, ‡7.

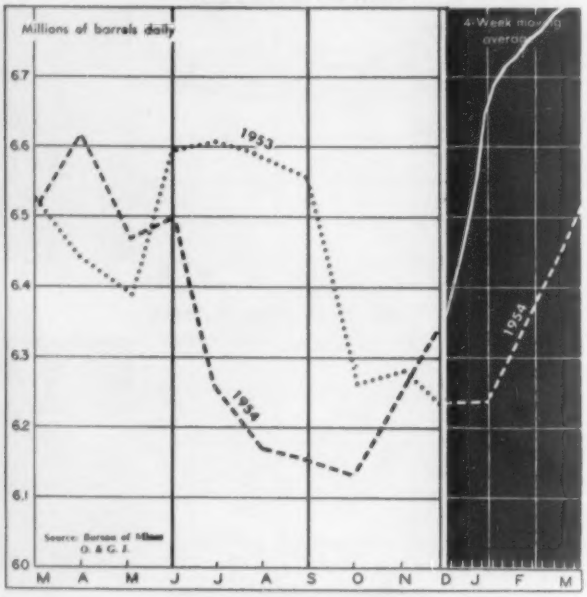
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



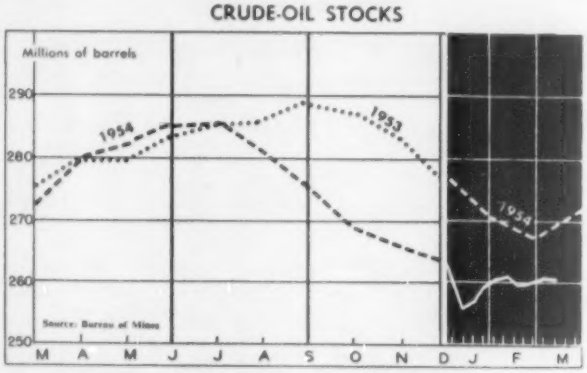
DAILY AVERAGE PRODUCTION FOR WEEK

	March 19 — Crude oil	March 19 — Lease condensate	March 19 — Total	Mar. 12 total
Alabama	4,200		4,200	4,100
Arkansas	72,800	400	73,200	73,000
California	971,100		971,100	970,300
Colorado	138,300		138,300	138,700
Eastern	48,500		48,500	48,500
Florida	1,400		1,400	1,400
Illinois	211,900		211,900	211,300
Indiana	27,700		27,700	27,500
Kansas	339,200		339,200	339,100
Kentucky	38,800		38,800	39,303
Louisiana	658,300	53,200	711,500	711,200
North	107,800	3,200	111,000	110,700
South	550,500	50,000	600,500	600,500
Michigan	33,400		33,400	31,800
Mississippi	90,750	5,000	95,750	95,750
Montana	42,900		42,900	42,500
Nebraska	28,700		28,700	28,500
New Mexico	223,750	4,450	228,200	228,400
North Dakota	27,800		27,800	28,900
Oklahoma	564,600		564,600	564,400
Texas	2,920,000	52,950	2,972,950	2,972,950
Dist. 1	51,000	600	51,600	51,600
Dist. 2	151,000	8,200	159,200	159,200
Dist. 3	455,000	24,675	479,675	479,675
Dist. 4	258,000	5,900	263,900	263,900
Dist. 5	49,000	525	49,525	49,525
Dist. 6	127,000	5,675	132,675	132,675
East Texas field	237,500		237,500	237,500
Dist. 7-B	143,000	50	143,050	143,050
Dist. 7-C	190,000	4,600	194,600	194,600
Dist. 8	976,000	2,025	978,025	978,025
Dist. 9	195,000	650	195,650	195,650
Dist. 10	87,500	50	87,550	87,550
Utah	4,100		4,100	4,200
Wyoming	270,200		270,200	268,400
Others	‡300		‡300	‡300
Total U. S.	6,718,700	116,000	**6,834,700**	6,830,500
Change from previous week, up			**4,200**	
Canada	†334,775		†334,775	†304,425

Total U. S. production January 1-March 19 ..... 524,955,675 bbl.
Same period last year (crude plus cond.) ..... *495,556,590 bbl.

*Includes 8,073,200 bbl. condensate. †Week ended previous Monday. ‡Includes S. D. 100, Nev. 200.

CRUDE-OIL STOCKS



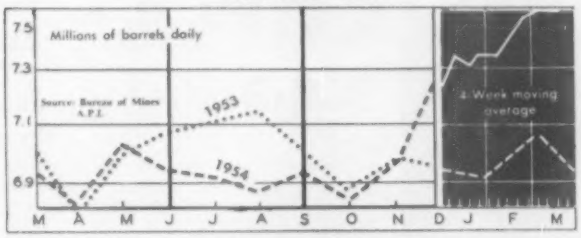
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

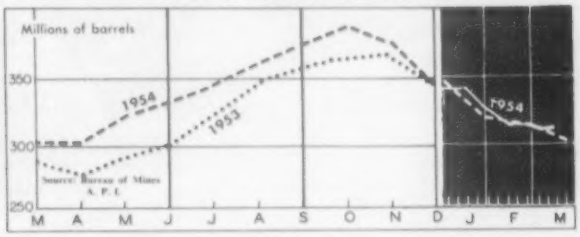
	Mar. 12, '55	Mar. 4, '55	Mar. 13, '54
Pennsylvania Grade	2,832	2,804	2,751
Other Appalachian	1,788	1,996	1,709
Illinois, Indiana, Michigan	10,902	11,375	11,549
Nebraska, N. Dakota	1,599	1,815	(‡)
Kansas	8,339	8,334	10,302
Oklahoma	24,508	24,073	26,376
Arkansas	3,077	2,943	3,061
Louisiana	14,534	14,140	14,441
North	2,550	2,558	2,620
South	11,984	11,582	11,821
Mississippi	3,061	3,102	3,271
New Mexico	8,160	8,465	7,051
Texas	118,729	118,951	120,130
East Texas Proper	10,226	10,527	10,448
West Texas	51,273	52,120	51,513
Texas Gulf	23,565	23,572	24,932
Other Texas	33,665	32,732	33,237
Wyoming	13,951	13,751	13,554
Other Rocky Mountain	5,382	5,338	3,333
California	32,225	32,353	34,032
Foreign	11,457	11,841	11,614
Total	260,544	261,281	263,174

*Bureau of Mines. Includes 2,819,000 bbl. in California. ‡Included with Kansas.

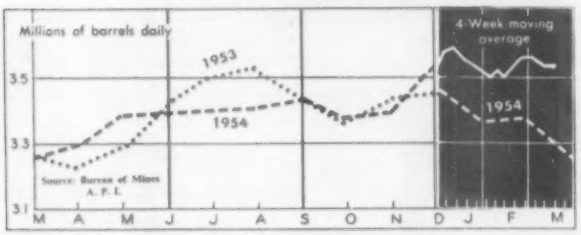
REFINERY RUNS



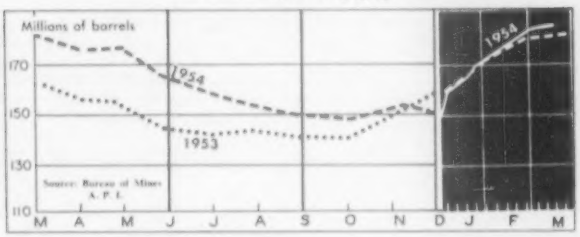
FOUR-PRODUCT STOCKS



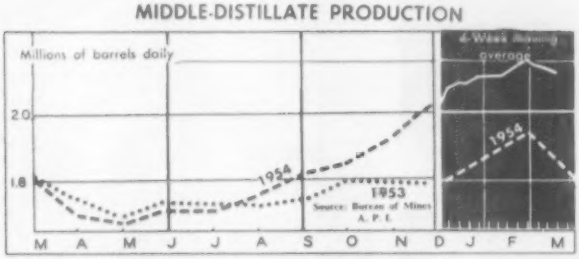
GASOLINE PRODUCTION



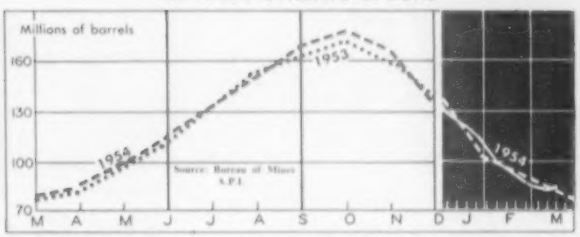
GASOLINE STOCKS



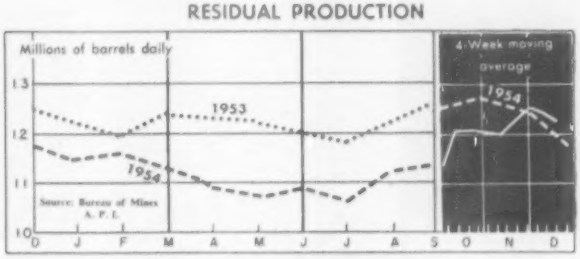
MIDDLE-DISTILLATE PRODUCTION



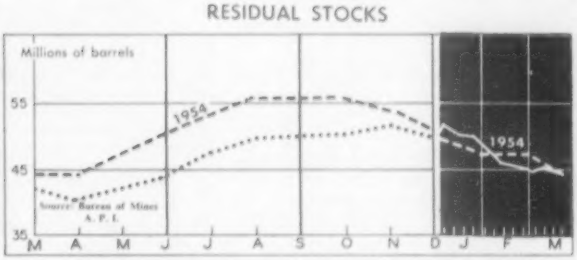
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



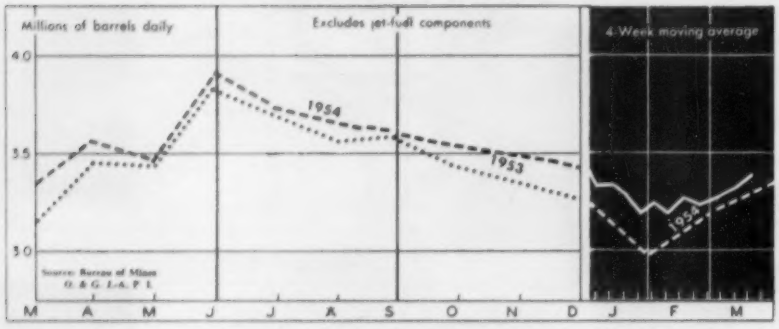
A.P.I. REFINERY REPORT, MARCH 18

(Excludes all jet-fuel components)
(Thousands of barrels)

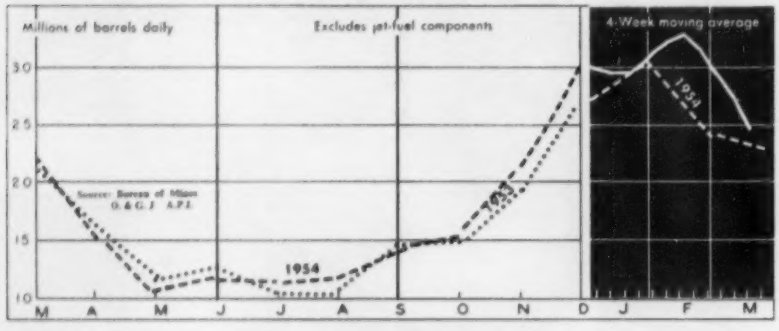
District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, March 1954 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,090	425.3	35.0	285.0	232.3	36,208	8,153	23,097	8,125	1,021	410.7	32.1	256.3	212.1
Appalachian:														
District 1	104	42.4	6.0	27.1	11.0	4,887	478	1,594	278	100	41.7	5.3	21.4	12.9
District 2	99	52.6	8.9	19.0	16.1	2,448	270	596	184	94	47.9	6.6	17.2	14.4
Ind., Ill., Ky.	1,388	678.6	75.0	291.3	190.4	40,975	4,465	10,272	3,109	1,274	662.6	73.3	240.3	175.4
Okla., Kans., Mo.	651	360.2	17.0	160.6	36.9	19,542	902	6,746	981	582	335.3	16.6	133.4	44.1
Inland Texas	263	169.4	9.1	46.3	23.0	6,814	321	969	1,270	244	167.0	10.5	43.0	27.8
Texas Gulf Coast	1,863	838.6	157.0	462.6	240.5	25,987	1,936	6,084	3,950	1,694	760.7	141.9	383.9	230.8
La. Gulf Coast	660	325.1	67.1	151.7	38.4	12,115	1,346	2,494	1,395	559	246.4	45.7	143.2	45.2
N. La. and Ark.	95	33.6	9.7	22.7	7.1	4,689	608	1,021	161	90	36.8	8.6	21.6	7.0
Rocky Mountain:														
New Mexico	16	8.6	1.0	2.0	2.1	149		79	28	19	12.2	0.8	3.2	2.5
Other Rocky Mt.	249	117.1	5.9	62.0	36.4	8,451	202	1,911	652	234	110.8	3.7	54.2	40.0
California	996	440.4	8.4	165.7	385.5	21,688	372	8,872	24,668	1,012	428.9	7.9	140.5	356.3
Mar. 18, 1955	7,474	3,491.9	400.1	1,696.0	1,199.7	183,953	19,053	63,735	44,801	6,923	3,261.0	353.0	1,458.2	1,168.5
Mar. 11, 1955	7,476	3,514.4	368.4	1,777.6	1,218.9	183,424	18,427	63,832	45,113					
Mar. 19, 1954	7,013	3,282.7	321.4	1,515.3	1,199.9	177,620	17,653	62,612	44,507					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.

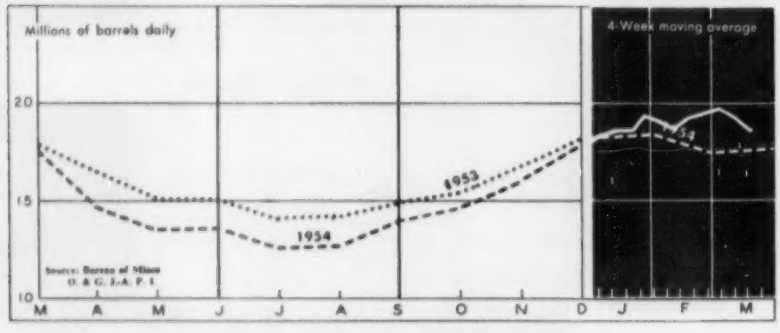
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of March 23, 1955. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.25-11	11.25-12	10.50-10.75
Premium gasoline	11.25-12	13-13.75	11.50-11.75
42-44 w.w. kerosine	9.5-9.75	10.6-10.7	9.5-9.75
No. 2 straw fuel oil	8.75-9.0	9.95	9.0-9.25
No. 6 residual	$1.50-1.60	$2.30-2.45	$1.95-2.00

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	4.5	4.0	4.25
Grade 18-55	5.4	4.9	5.15

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Calculated demand figures for light heating oils tend to approach actual consumption at this time of the year. Jobbers and consumers let their stocks run low near the end of the season, and every short period of cold weather brings a flurry of distillate sales. Some discounting was reported on the gulf before the last cold wave.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 3-18-55	3,534	3,386
December 1954	3,605	3,455
February 1954	3,365	3,182
March 1954	3,261	3,331
Middle distillate:		
Four weeks ended 3-18-55	2,156	2,468
December 1954	2,049	3,112
February 1954	1,957	2,413
March 1954	1,811	2,235
Residual fuel:		
Four weeks ended 3-18-55	1,223	1,865
December 1954	1,187	1,819
February 1954	1,241	1,742
March 1954	1,169	1,664

CRUDE PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87	....	....	
15-15.9	1.93	....	....	
16-16.9	1.99	....	....	
17-17.9	2.05	....	....	
18-18.9	2.11	....	....	
19-19.9	2.18	....	....	
20-20.9	2.24	$2.50	....	$2.37
21-21.9	2.30	2.52	....	2.39
22-22.9	2.37	2.54	....	2.41
23-23.9	2.45	2.56	....	2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9	....	2.76	3.09	2.63
34-34.9	....	2.78	3.11	2.65
35-35.9	....	2.80	3.13	2.67
36-36.9	....	2.82	3.15	2.69
37-37.9	....	2.84	3.17	2.71
38-38.9	....	2.86	3.19	2.73
39-39.9	....	2.88	3.21	2.75
40 and above	....	2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Sour. Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, January 21, 1955.

FLAT CRUDE PRICES

Representative posted schedules per barrel	
Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.50
Middle District	3.37
Southwest Pennsylvania	3.08
West Virginia	2.97
Buckeye Grade	2.91
Zanesville Grade	2.72
Illinois Basin	2.90-2.95

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CORE DRILLS, SPUDDERS, ROTARIES: New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa. Phone 4-9700.

80,000 BBL. floating roof API all welded and one 37,000 bbl. wood roof tanks located Brownstown, Illinois, both clean. Bargain for quick sale. W. C. Berry, P. O. Box 1858, Tulsa, Okla.

111 JOINTS 4½" 16.6# weight drill pipe, Spang Shrink Grip. Has drilled 40,000'. Selling account estate. Price $2.10 per foot, stored Tulsa area. No brokers, no commissions. Ray Hose, Hotel Capitol, Springfield, Illinois.

COMPRESSORS FOR INTEREST
in Gas Booster Plant. Will furnish type 80 Cooper Compressors for interest. Must have reasonable reserve. Box H-681, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 1—Beaird—Ingersoll-Rand packaged Compressor Plant, Type 6-JVG (165 H.P.) Heavy Duty, direct connected, 4-cycle, gas engine driven, single stage equipped with 3—4¼ x 9 compressor cylinders, three hand operated fixed volume pockets, two hand operated valve lifters, 20" O.D. 500# W.P. intake scrubber, air starting equipment and controls for automatic operation. Designed for intake pressure range 100#-250#, discharge pressure range 500#-600#. Delivery 3,480 MCF per day at 250# intake, 550# discharge. This plant has been in use less than 30 days and is located near Palestine, Texas. Box H-616, The Oil and Gas Journal, Tulsa, Oklahoma.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

USED EQUIPMENT

Franks Model 4000-TM Single Drum Well Servicing Units. Single Pole Past. Truck Mounted.

Franks Model Super East Texas Single Drum Well Servicing Unit. Truck Mounted. Handles 6500' work.

50/60 Ideco Skid Servicing Unit. Double Pole Mast. Mounted on International Tandem Truck.

O.C.S. Type 3 Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

Write, Wire or Call

FRANKS MFG. CORPORATION
BOX 3218, WHITTIER STATION
TULSA, OKLAHOMA

FOR SALE EQUIPMENT

FOR SALE: Nearly new S 33 Walker-Neer Spudder. Box H-702, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES AND RENTALS of Rotary and Cable tools. E. A. Kelly, Okla. City, 3125 S. E. 29th St. Box 861. JA 5-6407.

GAS METERS: Westcott and Foxboro Orifice Meters and Controllers. Bristol and Taylor Recording Pressure Gauges. GEO. R. MILNER, P. O. Box 124. OKMULGEE, OKLAHOMA.

FOR SALE: Two R. L. Cardwell Double Drum Spudders with derrick type masts. Would sell complete with Dog House, Light Plant, Wirelines, and Tools or with any part of them. Write Box 871, Seminole, Okla.

ROTARY RIG COMPLETE: 2,500 to 5,000 ft. capacity. Easily Portable. 4½-in. drill pipe. Double derrick, 7-ft. substructure, Model "S" Cardwell drawworks, 14-in. Gardner-Denver pump powered by LRO Waukesha. R. V. Dillard, Phone 1177 or write Box 992, Duncan, Okla.

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

FOR SALE

BOILERS—(8) 304 HP, 125 PSI, Kewanee, Firebox, ASME, complete. (1) 50 HP, 150 PSI, Titusville. (1) 500 HP, Heine, 180 PSI, 2-drum.

COLUMNS—11' x 84' bubble cap, 18 trays, 100 PSI.
9'x42'6" chrome lined, 150 PSI.
6'x37'2" chrome lined, 200 PSI.
35"x44" bubble cap, 18 trays, 18 caps per tray, 300 PSI.

DIESELS—(3) 2160 KW Busch-Sulzer, 3/60/2400/4160 Generators, complete. New 1943.

FURNACE TUBES—100 ton, Like New, 4" OD x ½" wall x 30', 4⅝ chrome.

HEAT EXCHANGERS—1530 sq. ft. Admiralty tubes.
268 sq. ft. Reboiler, steel, welded, 4-pass.

PRESSURE TANKS—(2) 10'x40', 30 PSI.
(2) 7'x45' 13,000 gal. vert., 60 PSI.
(1) 7'x24' 7000 gal. vert., 150 PSI.
(4) 7'x22'6" 6500 gal. vert., 100 PSI.

Heat & Power Co., Inc.
310 Thompson Bldg., Tulsa 3, Okla.—Phone: 3-4890
70 Pine St., New York 5, N. Y.—HAnover 2-4890

FOR SALE EQUIPMENT

FORT WORTH SPUDDER Super J-Keystone Model 50 on truck. Excellent condition. Also tools, trucks and pipe. Located in Cherryvale, Kansas. Carl Missimer, Russell, Kansas.

SALES and Rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

GOOD #1 GRADE USED 8" LINE PIPE FOR LESS!
Save almost ½ the cost of new pipe.
Lapweld 8⅝" O.D. 28.55 used pipe. Straight single random lengths. Machine cleaned. Plain and bevelled or screw end. 850 to 900 PSI. Pipe located in Illinois. Will sell for cash, or will finance meritorious propositions.

REDNEB PIPE CO.
P. O. Box 1798, Shreveport, La., Phone 2-3276.

LIQUIDATION
GAS COMPRESSION RECYCLING PLANT

6—IR Type KVG Gas Engine Driven Compressors, 600 HP and 660 HP.

$50,000 of new spare parts for compressor.

2—IR starting air compressors. Model 25C Type 40, air cooled, 265# discharge pressure, 67.6 cfm, 25 HP, Xpl motor.

6—M. W. Kellogg, 2,400 sq. ft. heat exchangers 590—1" 14 gage, 18' long Admiralty tubes each.

3—150# drums; 10 x 20, 8 x 16, 6 x 20.

6—centrifugal pumps; 200 g.p.m. 90' hd., 60 g.p.m. 460' hd., 400 g.p.m., 290' hd.

WIRE! PHONE! WRITE!
LIQUIDATION LEVELLAND, TEX.

6 x 53 chlin tower, mfg. 1951.
6'6" x 55', 6' x 27', 5' x 27', 42" x 49', 30" x 35' towers.
1600, (4) 500 Sq. Ft. ADM HT exchangers.
(2) 800 Sq. Ft. (675# 800° F.) St. Exchangers.
BJ 5-St. N. ch. pump, 400 g.p.m. 2100' hd.
5' x 38' 90# CHR Vessel.
Steel, chrome pipe, valves, fittings, etc.

AVAILABLE ELSEWHERE

7' x 26' SS, 7'6" x 56' towers.
(4) 424 sq. ft. ADM exchangers.
10—1500, 360, 260 sq. ft. St. Ht. exchangers.
3—RA-8, MA-4 Clark engines.
6—325# Vessels 10' x 35', 7' x 30', 4' x 40'.

Detailed circular upon request.

BRILL EQUIPMENT COMPANY
4101 San Jacinto St., Houston 4, Texas, Locust 1351
New York Office, 2401 Third Ave.,
Telephone Cypress 2-5701
Sell us your surplus equipment

FOR SALE EQUIPMENT

FOR SALE: Pipe threading machines; 18" Bignall-Keeler; 13" Bignall-Keeler with Landis head; 8" Williams plus 6" Williams head; and 2" Landis. Call or write Singer Supply Company, P. O. Box 1522, Oklahoma City. Phone REgent 6-8506.

FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted—max. discharge pressure 100 lbs.—6" suction—5" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 2, Md., Curtis 7-5050.

FAILING 1500 heavy duty drill with 4½x6 pump, automatic pulldown, and mounted on International truck. Write P. O. Box 819, Longmont, Colo. Phone 1333.

BUCYRUS-ERIE Spudder—36 L. Buda engine, butane equipped. Auxiliary leg. Tools from 15½" to 5". Completely equipped and ready to drill. Inventory furnished upon request. Robert J. Orr, 1928 Crestview Dr., Bartlesville, Okla. Phone 5427.

FOR SALE—In Oklahoma and Missouri 12 500 HP 4 cylinder Vertical Diesel engines and 5½" x 30" and 6¾" x 24" Horizontal Triplex Plunger Pumps fitted with steel fluid ends. Operational changes render surplus. Complete data upon request. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

COMPLETE YEAR OLD 2-150 bbl. welded tank battery, horizontal separator, Lufkin B-40 jack with electric motor and controls. 3,000' string rods and tubing. Can be seen near Bristow, Oklahoma. Call Wilson Exploration Company, ED 9831, Fort Worth, Texas.

FOR SALE

Large quantity 4" used steel line pipe, excellent condition, for immediate delivery by owner.

THE GORDON CO.
1514 Kanawha Blvd. East
Charleston, West Virginia
Telephone No. Dickens 4-1514

2,000 FEET

STEEL PIPE

30 ft. O.D.—⅜" Wall; Electric Weld, 35' - 42' lengths. Approximately 118 lbs., per foot.

(NEW REJECTS)

SPECIAL LOW PRICES

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ROTARY RIG FOR SALE

Consisting of Wilson Giant Drawworks, G.M.C. Diesel Engines, 7¼" x 14" Gardner-Denver Pump, L. C. Moore Portable Derrick, 5200' of 4½" F.H. Drill pipe, Dog Houses, Water Tanks and etc. Rig is complete with all tools and in very good condition to start drilling.

CONTACT

H. L. Herbel,

BOX 506,

CHASE, KANSAS.

Phone #LD43 or 196.

FOR SALE EQUIPMENT

FOR SALE—in Seminole area 6—10' x 40' riveted and welded horizontal gasolene storage tanks. Cities Service Oil. Patridge, Bartlesville, Oklahoma.

N-4 BREWSTER Single Drum Drawworks with one WAK Waukesha Engine—Less than 3 years old—Excellent condition—$11,000.00—Contact Dick Schriber, Iverson Supply Company, Phone 7-2349, Odessa, Texas.

SULLIVAN 200 complete with tools ready to work, located Tulsa, Oklahoma. Contact R. F. Mesker, 1129 E. 15th St., Phone 4-9483.

EQUIPMENT WANTED

WANTED—Rockwell—Emco Integrator. Must be in good condition and will compute all makes of orifice meter charts. Box H-715, The Oil and Gas Journal, Tulsa, Oklahoma.

(2) 17" COMPRESSORS lined to 13" to 14" complete with liners and pistons for Watts-Miller, Type 4, 225 H.P. Engine. Write Columbian Carbon Company, Box 873, Charleston, W. Va.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

WILL CONSIDER buying or leasing used seismograph equipment and trucks. Must be in good condition and reasonably priced. Please give full description, prices and present location in first letter. Box H-565, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

WANTED: Cable tool drillers on the Bucyrus-Erie Spudder Machine, drilling water wells. Steady work. EGERER-GALLOWAY WELL CORPORATION, 1012 North Third Street, Milwaukee 3, Wisconsin.

EXPERIENCED MAN to take complete charge dismantling Oil Refineries. Knowledge in handling usable and scrap materials. Box H-687, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED, MANAGER OF FOREIGN DRILLING OPERATION

Oil well drilling contractor has immediate opening for drilling engineer in Africa. Single status job with liberal salary and bonus.

Drilling & Exploration Company, Inc.
P. O. Box 2—Station "H"
Los Angeles 44, California.

HELP WANTED

EXPERIENCED LANDMAN, under 35, needed for independent oil producer. State salary required. P. O. Box 2775, Dallas, Texas.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

IMMEDIATE OPENING for process engineer with experience in operation and design of petroleum refining equipment. Refinery located in southwest. TCC catalytic cracking experience desirable. Write giving resume of experience, availability and salary desired. Box H-628, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER OR GEOLOGIST

with broad general knowledge of the petroleum industry in East Texas, North Louisiana and South Arkansas to fill position with well established firm in area. State qualifications in detail.

Box H-705, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR A BETTER-PAID JOB

Production and Reservoir Engineers, Geologists, Draftsmen; Geophysicists, Party Chiefs, Computers and Field Crew Staff. WRITE US—STRICTEST CONFIDENCE.

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Major oil company has openings for graduate Junior & Senior Petroleum Engineers in its operations in Venezuela. Salary commensurate with experience.

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To an Outstanding Drilling-Production Engineer . . .

Mail in confidence to:
The Oil and Gas Journal—Engineering Dept.
P. O. Box 1260—Tulsa 1, Okla.

I am interested in your drilling-production position in Tulsa, and am mailing an experience resume.

Name .....

Address .....

City ..... State .....

WE'D like to offer you an unusual opportunity to prove your ability, advance in your career, and make a significant contribution to petroleum engineering.

Specifically, there is a position open for a young engineer on the editorial staff of The Oil and Gas Journal as a drilling-production editor in our Tulsa office.

In this position . . .

- You'll have plenty of opportunity to prove your ability as you write, solicit, and edit technical articles on the newest, most important developments in your field each week.
- You'll have a truly unusual opportunity to advance in your career because you'll constantly broaden your knowledge of your field—both through the information you handle and the contacts you make.
- You'll have every opportunity to contribute work of high significance to your profession, both in the technical articles you write and in the help you'll give outstanding authors in communicating their technical know-how to an industry audience of 35,000 oil men.

This is a permanent staff job. And speaking of staff, we've carefully handpicked ours to be not only the best in the business but also the friendliest, most stimulating, and most fun to work with.

In short, we offer you a challenging, interesting, rewarding job. How about telling us what you offer—degree, college record, experience, aptitude for writing, writing experience, samples, etc.? Put it in a letter addressed to Engineering Department, Box 1260, Tulsa. We'll be happy to hear from you.

HELP WANTED

PETROLEUM GEOLOGIST

Wanted for Staff position in growing independent oil company in West Texas. Must be man of mature age and judgment with at least ten years of practical and successful oil finding experience in exploration and development geology. Should have administrative ability to organize and supervise the work of two or more district geological offices. Salary will be commensurate with experience and abilities. Preferable age limits 35 to 45. In replying please give complete personal and professional background and references. Small recent photo would be helpful. All applications will be treated in utmost confidence, but personal interview will be arranged only if data furnished is adequate and meets our requirements. Box H-691, The Oil and Gas Journal, Tulsa, Oklahoma.

ESTIMATOR

Experienced in process equipment and piping costs for chemical plant and refinery construction. Position offers good future with progressive Penna. firm. Send resume to—

J-65, P. O. BOX 3575
PHILA., 22, PA.

PETROLEUM ENGINEER

for patent liaison work, preferably with field experience. The work involves evaluation of ideas and data, accurately describing and delineating inventions, advising patent attorneys on technical questions, and collaborating with attorneys and inventors in the preparation of patent applications. The position, at a large integrated petroleum research laboratory, affords contact with various aspects of drilling and production. Write

BOX H-686,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

GEOLOGIST

Active independent oil company has opening in Tulsa office for qualified subsurface geologist. Must have well-rounded experience in Mid-Continent Area, particularly Oklahoma, and must be capable of handling geological operations at divisional level. Age limit 40. Excellent position for right party. Give complete summary of experience and qualifications in letter. All replies confidential.

BOX H-650,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

PETROLEUM ENGINEERS

Experienced graduate engineers or recent graduates, for immediate and future job openings in Saudi-Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

Salaries commensurate with education and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 40

ARABIAN AMERICAN OIL COMPANY
505 Park Avenue
New York 22, N. Y.

HELP WANTED

GRADUATE GEOLOGIST, under 30, needed immediately for established independent oil company. No experience necessary. P. O. Box 2775, Dallas, Texas.

GEOPHYSICAL SUPERVISOR, foreign experience preferable, by established contract Seismograph Company. Dallas organization. Salary commensurate with experience. Give full qualifications and references. Maximum Age 50. Box H-688, The Oil and Gas Journal, Tulsa, Oklahoma.

BOOKKEEPER-AUDITOR needed by independent oil and gas producer in East Texas. Prefer individual with at least five years experience in oil and gas accounting, including local, state, and federal taxes and royalty accounting procedure. Nice salary. Replies confidential. Box H-680, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED SEISMOGRAPH Party Chiefs and Seismologists by established contract Seismograph Company. Dallas organization. Salary commensurate with experience. Give full qualifications and references. Maximum Age 40. Box H-689, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER

Experienced in the design and operation of oil-well drilling and production equipment. To work in Los Angeles, Calif. area. Send complete resume, including salary requirements. Box H-703, The Oil and Gas Journal, Tulsa, Oklahoma.

TOOLPUSHER, Abilene, Texas area capable handling Drilling Supt. duties later. Also may participate profit sharing plan. Must have varied West Texas experience. Write Letter giving experience, references, education, age, etc. Box H-708, The Oil and Gas Journal, Tulsa, Oklahoma.

STAFF ENGINEER

Major operator of gasoline plants has staff opening for qualified process, design and construction engineer. Requires supervisory experience and ability to direct major programs. Must have engineering degree with minimum of ten years experience in the field of gasoline plant design and construction. Salary commensurate with experience and qualifications. Age limit 40.

Send detailed personal and work history with photograph to

Box H-706, The Oil and Gas Journal,
Tulsa, Oklahoma.

Major Oil Co. Has Opening For A CORROSION & MATERIALS ENGR.

Should be 40 or under with 5-10 years exp. in oil refinery corrosion and metallurgical work.

GOOD WORKING CONDITIONS
EXCELLENT BENEFITS
ATTRACTIVE COMPENSATION
Position in NYC area.
Send full particulars to

BOX H-704,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

SITUATIONS WANTED

GEOLOGIST—master's degree, major company experience in Cuba. Surface, subsurface, log interpretation, micropaleontology. Three years in foreign exploration, fluent Spanish. Employed. Desires position in Cuba. Box H-683, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, M. Sc., would like position in Colombia. 5 years subsurface experience with major company in gulf coast. Box H-711, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING AND PRODUCTION Superintendent, 42. 15 years varied experience, location open. Box H-701, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOLOGIST, 9 years experience with large contracting seismograph company in Oklahoma, Texas, Louisiana, Mississippi and Alabama. Desires position with permanent location. Box H-713, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

DRILLING AND PRODUCTION MAN. A man of mature age and judgment, with good sound technical thinking, 18 years varied experience in drilling and production, desires position with Independent Company or Drilling Contractor, best of references. Box H-709, The Oil and Gas Journal, Tulsa, Oklahoma.

SUBSURFACE GEOLOGIST, 31, desires position with independent producer or company, 7½ yrs. major, independent experience Gulf Coast and Southwest Texas. P. O. Box 435, Houston 1, Texas.

EXPERIENCED REFINERY laboratory tester, knock engine and cetane engine operator & maintenance. Box H-700, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

SET OF Oklahoma Completion Cards, Rinehart or Research. State number of years available and price. Box 1104, Tulsa.

WANTED drilling blocks large or small. Send full information first reply. Including maps, geology and price. All information will be returned. Box 22, Greenville, Texas.

WANTED—proven production. Independent oil company has cash to invest. Send complete information including engineering. Prefer to deal direct with principals. Box H-675, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—IDEAS

Inventions that are related or can be adapted to the oil industry. We offer capital, technical advice, patent assistance, market research, a manufacturing plant, and a sales outlet; everything to put your invention on the market. Write P. O. Box 1665, Houston 1, Texas.

SETTLED OIL production wanted by independent operator direct from producer. P. O. Box 852, Oklahoma City, Oklahoma.

WESTERN CANADA—Manufacturers Representation—Graduate Mechanical Engineer—desires accounts for sale to oil, gas industries; refineries, pipelines. Excellent contacts. Box H-695, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

URANIUM INVESTORS. We are now in a position to offer investors a special service. A Fee of $250. will locate and file a claim for you in Colorado or Utah. We can handle only ten accounts weekly. Therefore for quick service write now for further information and your account number. Uranium Prospectors & Investors Exchange. 516 N. 8th St., Independence, Kansas.

SEVERAL HUNDRED validated uranium claims available for sale or farmout proposition to responsible parties. Proven ore bodies, claims with mining in process or exploration properties. Located in Gas Hills area, Fremont County, Wyoming and Colorado Plateau area. Inquiries of substance given prompt attention. Write P. O. Box 626, Casper, Wyoming.

EXPERIENCED OILFIELD supply man wants to contact drilling contractors, purchasing agents and operators for organizing a new oilfield supply Co. Box H-710, The Oil and Gas Journal, Tulsa, Oklahoma.

REAL ESTATE

AMBASSADOR HOTEL, Palm Springs, Calif. Property you'd be proud to own, and a tax saver.

LOUISIANA PARADISE — Agriculture — Cattle — Wild Game — 3000 Acres most fertile delta land in south. 3 bales cotton per acre. Cattle, natural year round range. Wild deer, turkey, squirrels and ducks. Thirty - forty thousand dollars merchantable timber. Thirty miles of fence. Good oil possibilities. Not leased. Quick sale, $75.00 per acre. Full description, write—Dr. N. E. Wilson, Homer, La.

GRAYSON COUNTY, TEXAS. For Lease: Offices—Warehouse—Unimproved sites with or without rail siding. Munson Realty Co., Denison, Texas.

NEW PRODUCTS

NEW PRODUCTS for license, outright sale, or franchise. Monthly digest—$1.00. Ten dollars annually. Digest D1, Box 2052, Austin, Texas.

ROYALTIES

PIPELINES ANNOUNCED: Projected pipelines indicate increasing action in central Williston Basin, where we specialize in royalties in major company blocks. For informative material, write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Mont.

NEW CUSTOMERS SOLICITED. You can now make very small investments on income Royalties or those ahead of Drilling. A. S. Berry, P. O. Box 1383, Tulsa, Okla.

OFFERING CHOICE PRODUCING oil income royalties with large reserves per Dollar investments. A. S. Berry, P. O. Box 1383, Tulsa, Okla.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bldg., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

LEASE AND DRILLING BLOCKS

FOR SALE: 480 acres, 5 Bartlesville wells. Box 322, Chanute, Kansas.

HAVE SEVERAL oil & gas leases in UTAH & WYOMING I will sell to the highest bidder. Box H-707, The Oil and Gas Journal, Tulsa, Oklahoma.

URANIUM & THORIUM RARE Earths. Properties for sale ready to produce. SW Colo. E. H. Grantham, Ordway, Colo. Phone 9921.

160 OIL LEASE Farnam Dome, Utah, near new gas well. Bargain. R. O. Barnsley, 950 Lincoln Ave. Palo Alto, California.

Will pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

CONTACT A. L. Bowles, Box 947, Ada, Okla., for Drilling Deals, Oil Investments.

DUE TO DEATH in family of interest owner, we are forced to sell two producing and one non-producing leases in Montgomery County, Kansas. Bartlesville sand production. Carl Missimer, Russell, Kansas.

FOR SALE: South ½ of S.E. ¼ of NW ¼ of Sec. 19 Township 8 North Range 9E. Hughes Co., Okla. Consisting of 23½ acres. Two producing wells & fully equipped with two storage tanks and heater. Write Pittsburg Development Corp., Highland, Ill., for further details, or telephone attention of Mr. Hank Weder.

HAVE ACREAGE in center old Oklahoma oil field, just finished Dutcher well, geologists engineers report only small amount of oil has been taken out. Good deal for someone financially able to drill more wells. Box H-714, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTRACTIVE DRILLING deal on potential gas acreage in North Collingsworth County, Texas—Panhandle Field Extension—One mile from production—2000 feet deep—Large reserve—Reasonably priced. Box H-712, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASES ROYALTIES

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Equipment Men . . . in the News

Gwinner Elected A.I.M.E. Mid-Continent Chairman

Russell H. Gwinner, vice president of First National Bank & Trust Co., Tulsa, has been named 1955-56 chairman of the American Institute of Mining and Metallurgical Engineers, Mid-Continent section.

Gwinner, a member of the First National's oil-loan department, succeeds M. B. Penn, of Mid-Continent Petroleum Corp.

Prudhonne Appointed to New Position by Oilwell

PRUDHONNE

The appointment of Robert J. Prudhonne as district engineer, compressor and engine sales for the Oil Well Supply Division, U. S. Steel Corp., has been announced by William Miskimins, Central Midwest area manager. Prudhomme was employed in 1952 as assistant district engineer, compressor and engine sales, at Oilwell's Dallas headquarters, the position he held until his present appointment. He had 4 years' experience in sales and engineering work prior to his employment with Oilwell.

Franklin Makes Sales Organization Changes

Because of the increasing importance of the area, Leland (Pelie) Strouse, vice president of Franklin Supply Co., in charge of the Rocky Mountain-Western Canada area, has moved to new offices in Denver. In addition, a New York office to handle eastern and export sales has been opened according to Jene Harper, president of Franklin Supply Co., Chicago.

L. P. STROUSE

J. L. ORR

Strouse, formerly in charge of the Texas-New Mexico area, will supervise the operations of Franklin stores in Fort Morgan, Colo., Casper and Newcastle, Wyo., as well as the Canadian office in Calgary and the store in Edmonton.

John L. (Jack) Orr, formerly with the Chicago sales office, has been placed in charge of the New York office.

Successful Wildcats

(Continued from page 194)

Harris County: Houston Oil Co. of Texas 1 Swilley et al, Block 6, Victor Blanco Sur., A-2. IP 45.54 BOPD, 5/32-in., 45°, perforations 8,130-40 ft. TD 9,615 ft. (New field—Victor Blanco.)

Jackson County: R. E. Hibbert 2 Hensley, Josiah Bell Sur. IP 198 BOPD, ⅛-in., 47°, perforations 8,734-40 ft. TD 9,515 ft. (New field—7 miles northeast of Port Comfort.)

Refugio County: Continental Oil Co. 2-V James Welder heirs, Power & Hewitson Sur., A-54. IP 2,314 M.c.f. daily and 24 BCPD, open-flow potential, 47°, Frio 5,295 ft. (top). TD 6,025 ft. (New pay in Vidauri field.)

EAST TEXAS

Gregg County: John C. Robbins and F. R. Jackson 1 Grissom, Dinsmore Simpson Sur., 9 miles SE Longview. Formerly drilled dry to 7,209 ft. IP 160 BOPD, 25/64-in., 43°, TP 450 psi., GOR 1,160, Pettit lime 7,020-40 ft. TD 7,212 ft.

WEST CENTRAL TEXAS

Callahan County: W. D. Austin 2-A Snyder, Sec. 142, BBB&C Sur., 6 miles NE Baird. IP 333 BOPD, ¼-in., 42°, TP 300 psi., GOR 300, Cross Cut sand 2,592-2,602 ft. TD 2,603 ft., elev. 1,761 ft.

Throckmorton County: Warren Petroleum Corp. 1 Batchler, Sec. 2122, TE&L Sur., 10 miles E Throckmorton. IP 408 BOPD, 18/64-in., GOR 393, pay 4,526 ft. TD 4,730 ft. Tubing pressure and gravity not reported.

NORTH TEXAS

Montague County: M P S Production Co. 1 Clark, Sec. 43, ETRR Sur., A-247, 7 miles SW Bowie. IP 129 BOPD, 12/64-in., 43°, TP 550 psi., GOR 998, top Ellenburger pay 6,658 ft. TD 6,750 ft.

Young County: Miller & Banks 1 Anderson, A. C. Anderson Sur., A-2115, 10 miles SE Graham. IP 72 BOPD, 16/64-in., TP 50 psi., 39°, GOR 150, pay 1,555 ft., TD 1,573 ft.

Wesley Stephens 1 Johnson, C. W. Johnson Sur., A-2252, 8 miles SE Graham. IP 164.5 BOPD, 12/64-in., 42°, TP 300 psi., GOR 420 conglomerate pay 4,372-82 ft. TD 4,425 ft.

Wise County: Lloyd H. Smith, Inc. 1 Henry, J. Coughlin Sur., A-151, 2 miles NE production, 4 miles SE Chico. IP 116 BOPD, 12/64-in., TP 190 psi., 38.6°, GOR 81, pay 3,978-94 ft. TD 6,105 ft.

SOUTHEAST NEW MEXICO

Lea County: T. J. Sivley 1 Fox-Federal, 18-18s-34e. IP 65 BOPD, ¾-in., 36°, GOR 550, Queen 4,373 ft. TD 4,413 ft.

WEST TEXAS

Borden County: Tennessee Gas Transmission Co. 1 Fambrough, 18-33-T3N-T&P. IPP

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56 BOPD, 40°, GOR 143, reef pay 9,027-45 ft. TD 9,216 ft.

Garza County: Curtis R. Inman 1 Roy, 118-5-H&GN, 5 miles NE Justiceburg. IPP 71 BOPD, 36°, GOR 240, pay 2,390 ft. TD 2,421 ft.

Pecos County: G. D. Putnam & Co. 1 McDonald, 6-F-TCRR, 5 miles NW Bakersfield. IP 7,900 M.c.f., pay 2,910 ft., shut-in pressure 1,450 psi. Old TD 1,507 ft., new TD 4,995 ft.

Sterling County: J. B. Randle 1 Munn, 170-2-H&TC, 8 miles NE Sterling City. IP 228 BOPD, 19/64-in., TP 350 psi., GOR 893, 43°, pay 7,355 ft. TD 7,497 ft.

Sutton County: El Paso Natural Gas Co. 1 Fields estate, 22-B-HE&WT, 3 miles E Sonora. IP 1,604 M.c.f., calculated open flow, SITP 1,260 psi., top pay 4,302 ft. TD 5,700 ft.

Tom Green County: American Trading & Production Corp. 2 Tom Green County, J. Zerbach Sur. 827, 2 miles E Christoval. IP 148.9 BOPD, 16/64-in., 39.6°, TP 230 psi., GOR 320, pay 5,316-42 ft. TD 5,709 ft.

L. L. Lookabauch, Jr. 1 John Rust estate, San Saba CSL Sur. 963, 10 miles NW San Angelo. IP 161 BOPD, 10/64-in., 48°, TP 50 psi., Ellenburger pay 6,603 ft., TD 6,617 ft. Elev. 2,140 ft.

SOUTH LOUISIANA

Assumption Parish: Hassie Hunt, trustee, et al 1 Kittridge, 79-14s-14e. IP 100 BCPD and 3,000 M.c.f. daily, 10/64-in., 58.2°, perforations 9,822-26 ft. TD 13,250 ft. (New field.)

Terrebonne Parish: Texas Crude Oil Co. 1 LL&E, 4-18s-16e. Shut-in gas well, no gage, perforations 6,568-76 ft. TD 11,000 ft. (New pay in Orange Grove field.)

Vermilion Parish: Phillips Petroleum Co. 1 Champagne, 8-14s-3e. IP 135 BCPD and 6,000 M.c.f. daily, ¼-in. choke, 50.2°, perforations 12,381-400 ft. TD 13,307 ft. (Extends, and new pay in North Erath field.)

KANSAS

Clark County: Shamrock Oil & Gas Corp. 1 Stephens "H," C SE SE 10-32s-21w. IPF 44 BDPD, 14,000 M.c.f. of gas per day, Morrow sand 5,193-5,207 ft., ½-in. choke. TD 5,215 ft. (Discovery well of Northeast Morrison field.)

Graham County: Heathman-Seeligson 1 Irwin, 1¾ miles from nearest production, SW SW NE 12-10s-23w. IPP 357 BOPD, Sooy 4,088-99 ft. TD 4,200 ft. (Opens Southeast Law pool.)

Russell County: Western Development Co. 1 Worley, 1½ miles from nearest production, NW NW NE 4-11s-15w. IPP 5 BOPD, Lansing lime 3,204-09 ft. (Oil discovery.)

COLORADO

Moffat County, Shell Creek: Mountain Fuel Supply Co. 1 Government, C SW SW 1-11n-100w. IP 7,450 M.c.f. of gas per day, Fort Union discovery, new field. TD 7,948 ft. Mesaverde.

MONTANA

Powder River County, Pumpkin Creek: George J. Greer, Trustee 1 Allen, SW SW SE 24-1s-49e. IP 15,500 M.c.f. of gas per day through casing-tubing annulus from Eagle sand, gas discovery, new field. TD 3,128 ft. Telegraph Creek.

ALBERTA

Imperial-Canadian Superior 6-17 Buck Creek, LSD 6, 17-48-6w5. Cardium oil well. TD 4,850 ft.

Stanolind-Hudson's Bay "A" 1 Blue Rapids, LSD 16, 1-47-10w5. Indicated Cardium oil well. TD 5,970 ft.

"B" 1 Rose Creek, LSD 2, 36-46-9w5. Indicated Cardium oil well. TD 5,609 ft.

LEGAL

SEALED BIDS will be received until 10:00 A.M. Wednesday, April 13, 1955, and opened at that time at the Anadarko Area Office for the leasing of allotted and tribal Indian lands located in Tillman, Grady, Cotton, Comanche and Caddo Counties, Oklahoma, for oil and gas mining purposes. For additional information write or telephone Mr. Hayes, Oil and Gas Division of the Anadarko Area Office (Phone 788).

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Santa Fe, New Mexico. Notice is hereby given that approximately 484.79 acres of land in five parcels within the known geologic structures of certain fields in Lea County, New Mexico, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, April 6, 1955, when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Land Office at Santa Fe, New Mexico. J. A. DeLany, Manager.

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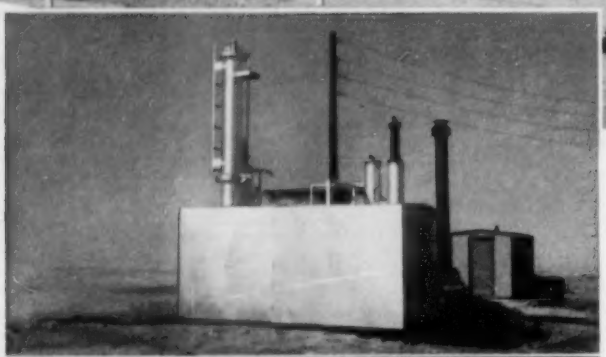

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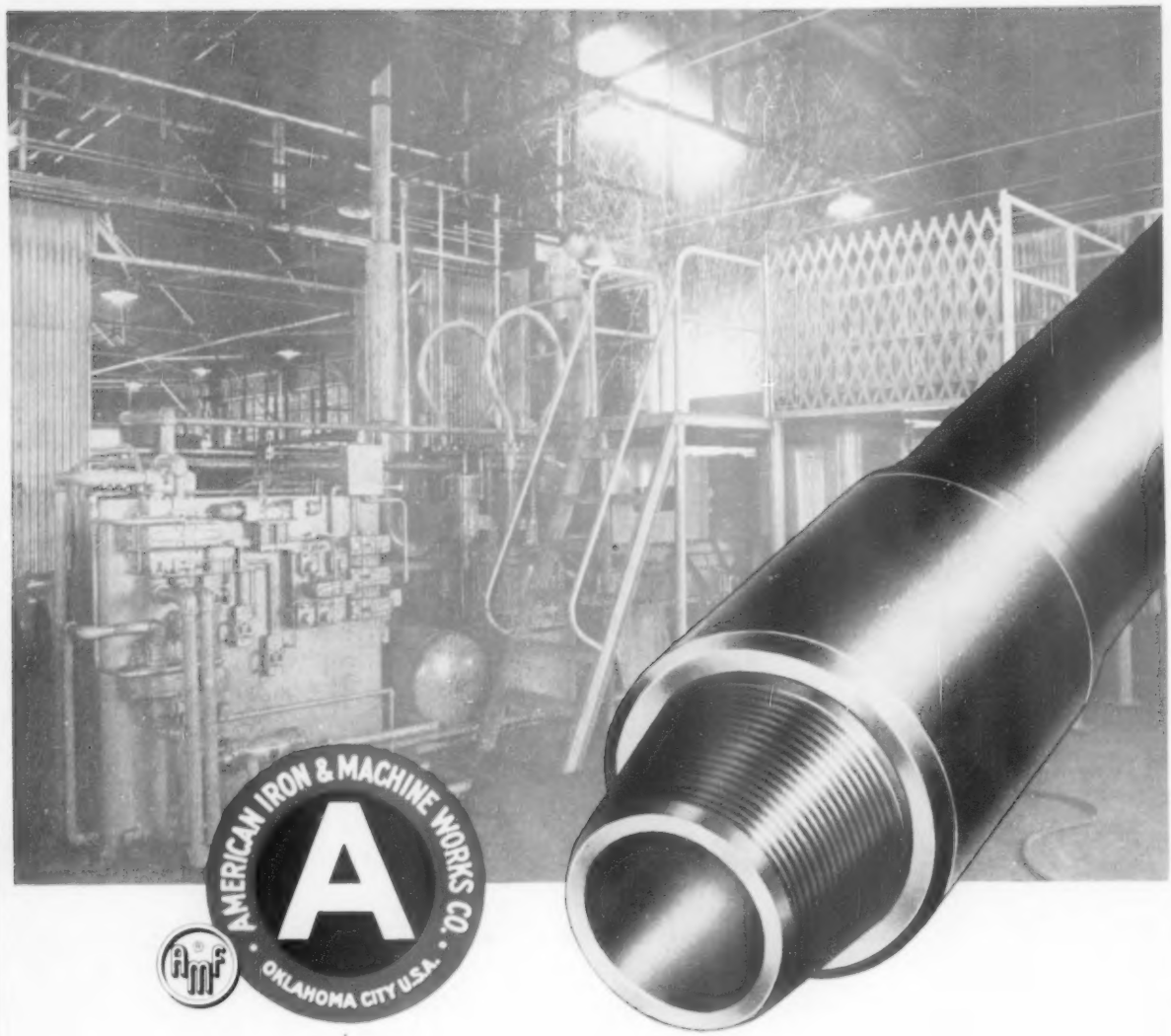

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